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ENGINEERING · INDUSTRY · SCIENCE · BUSINESS

FEBRUARY 1948

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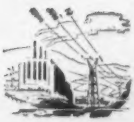

GENERAL ELECTRIC

15 seconds 30 seconds 12 sec 23 seconds 12 seconds

Actual Gear Shaving Production Figures

28 seconds 20 seconds 30 seconds 28 seconds

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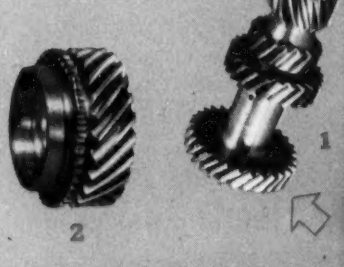
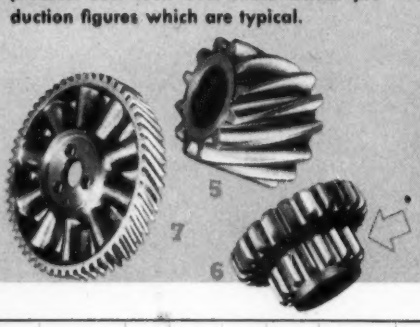
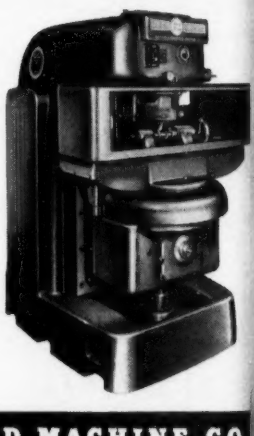




Gear	Material	Dia.	Face	Teeth	DP	Stock Removed over Pins	Machine Time
1	Steel	4″	11/16″	29	9.25	.010″	30 seconds
2	Steel	3 3/16″	1″	23	10.5	.010″	23 seconds
3	Cast Iron	2 5/16″	1 1/16″	28	10	.010″	20 seconds
4	Steel	2 1/4″	1 3/8″	14	7.6	.009″	28 seconds
5	Steel	1 1/8″	1″	12	13.5	.005″	9 seconds
6	Steel	2 9/16″	11/16″	14	6/8	.006″	15 seconds
7	Aluminum	6 1/2″	1″	56	10	.010″	25 seconds



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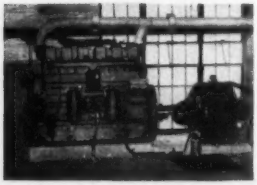

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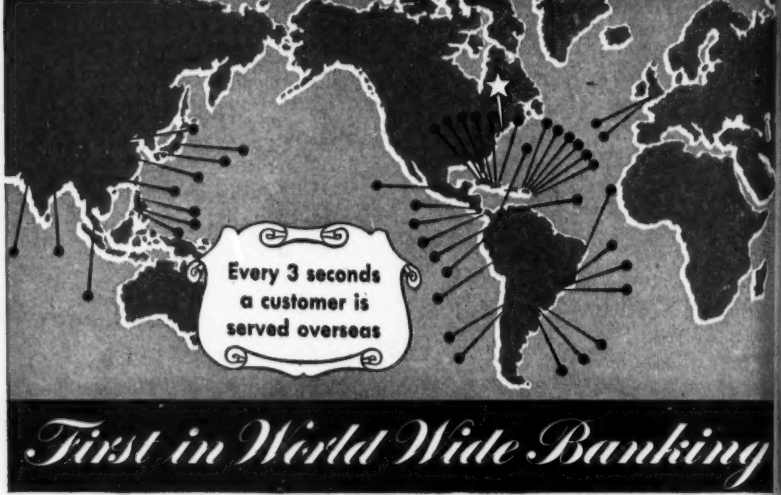

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BUSINESS TRENDS

General Business Good—U. S. business prospects are bright well into 1948—and may be through 1950 and beyond. The country had a short, sharp decline for a few lines, such as shoes, cotton textiles, women's and children's clothing, brass mills, and small radios. It has afflicted the stock market. Yet nothing basic has gone wrong with the economy. Home building took a strong upturn, commercial and industrial expansion proved more vigorous than expected, export trade exceeded all hopes, and inventory accumulation flattened out less than had seemed likely. Except for the tendency toward price inflation, the stage is set for sustained prosperity. Gross value of the production of goods and services now is above $230 billion annually.

Manufacturing Industries—Backlogs continue sizable, though they are being whittled down, especially in the consumer-goods industries. Standard machines are being given shorter quotation on deliveries. Steel is in short supply, and some new capacity is being added. Shortages in tin, antimony, and crude rubber are even more severe, and supplies of lead, cadmium, and hard fibers (sisal and agave) are close to critical. Labor, particularly skilled workers, is scarce. Employees totaled 15,696,000 in September, 1947, compared to 11,534,000 in 1929. The Federal Reserve Board index for total manufacture was 191 in September, 1947, compared to a wartime peak (1943) of 258 and a 1929 figure of 110.

Aviation—Estimated 1947 gross revenue for the aeronautical manufacturing industry is $1,150,000,000, some 300% above 1939. Last year was the best the airlines ever had in terms of passenger and ton miles—6,710,000,000 and 849,000,000. The airlines are improving with regard to financial losses.

Bus Industry—Between 1940 and 1946, the number of passengers carried increased from 4,719,500,000 to 10,551,000,000. Delivery of new vehicles is improving, and during 1948 new buses may be obtainable within 90 days of order or earlier. In first 10 months of 1947, more than 15,000 buses, not including school buses and 231 trolley buses, were delivered.

Chemical Industries—In 1947 the chemical industries established a new production record, reaching an estimated index figure of 434, compared to a wartime high of 403 in 1944. Production was about $9 billion.

Construction Industry—Construction started in 1947 is placed at $12 billion. Heavy engineering construction is put at $5.5 billion, 7% over 1946, with a sharp rise in the last few months. The inventory of proposed engineering construction totaled $40.7 billion in October, 1947. Construction machines still are in short supply, notably cranes, shovels, and tractors.

Electrical Industry—Peak electrical power load is within 5% of the 52,000,000 kw. of capacity. The industry is planning 18,000,000 kw. of new generating capacity for the 5-yr. period, 1947-51. Of this, over 15,000,000 kw. will be installed by privately owned power companies.

Electrical Products—Electrical wholesalers had the biggest year of dollar sales volume and tonnage in history, and expect 1948 to be even better. Appliance production in all lines, except refrigerators, was far higher in 1947 than in any previous year.

Electronics—There will be more new design, and overall business volume will be higher in 1948 than in any nonwar year, with bitter competition.

Food Processing—Food production exceeded all previous records in 1947, and was a third higher than in 1935-39. More than 19 million long tons of food was exported in year ending June 30, 1947, cereals making up 80% of the total weight.

International Trade—Three important developments point to increased world trade. First is the provision of dollars through U. S. emergency loans and the Marshall Plan. Second is the huge multilateral tariff accord resulting from Geneva negotiations. Third is continuing increase in industrial production in major countries.

Metalworking Industries—The peacetime record-breaking pace achieved during 1947 should continue through 1948. Metalworking plant expansion in 1947 set a new peacetime record. A seller's market has arrived, however, in some items, including radios, welding equipment, heat-treating units, and machine tools, to name five. Automotive production is close to 5 million units, including 1.4 million trucks. Output in 1948 should be 10% greater. New records will be made in 1948 in the manufacture of tractors, construction machinery, and farm implements. Backlogs represent, in general, a year's business. Office equipment production reached new highs in 1947, but the pile of orders continues to grow. Diesel locomotive production is flourishing, but makers cannot keep abreast of new orders. Railroad car builders are in the same situation. There is a year's backlog in heavy electrical equipment. Motor orders will keep all manufacturers busy through 1948.

Mining—With production estimated at 610,000,000 tons for 1947, the coal industry had its second best year. Exports increased 135% and will be maintained at a high level in 1948. Metal mine output continued at a high rate, and strong demand sustained record peacetime price levels.

Product Design—Competition between machinery builders is keen, and new models are being announced almost continually. The aim is faster machines which reduce production costs. Steel shortages are causing a restudy of possible substitutes, especially aluminum. Even the promised 2,500,000-ton increase in steel ingot production will not have a marked effect on the steel shortage, which is expected to carry well into 1949.

Textile Industry—Expenditures for plant renovation, modernization, and expansion in 1947 was $414,589,000. Much more could have been spent if materials and equipment had been available. The industry will see the effects of lowered tariffs in 1948, but until prices for fabrics abroad are reduced and availability becomes greater, imports into the U. S. will not be a great factor overall, although they may be important in spots. Lower wool tariffs should benefit mill operators.

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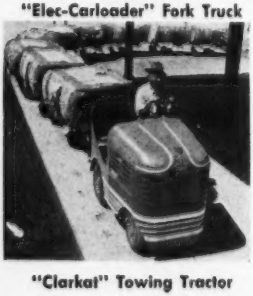

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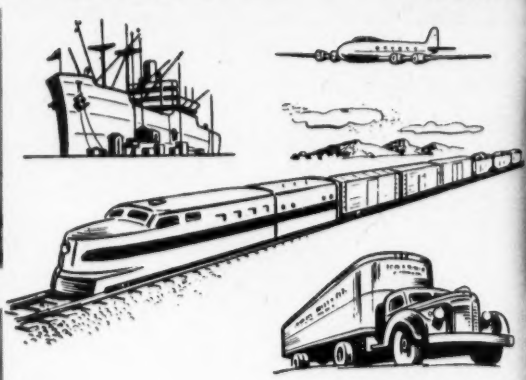

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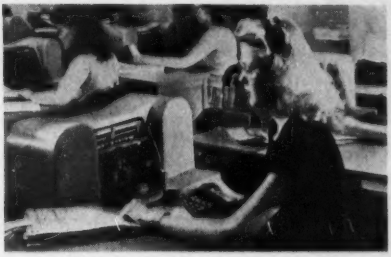
BEFORE—Original lighting and painting resulted in unsatisfactory brightness ratios in excess of 100 to 1.



AFTER—Final conditions provide comfortable brightness ratios, increase efficiency and morale.

More Light, More Work

Resulting from 2-yr. study, improved visual conditions increase production in income tax office. New lights, colors, eye tests involved

Better visual conditions in a punch-card room of the Bureau of Internal Revenue increased production 5.5% and definitely increased worker morale. The work rate increase was obtained despite the fact that the tax forms in use were considerably more complicated than those employed before visual conditions were improved.

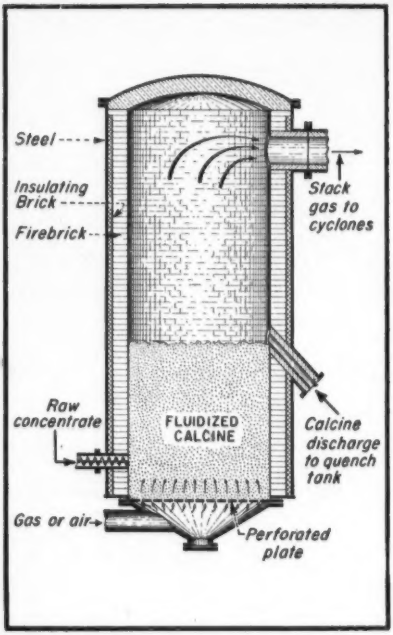
Visual improvements included better lighting, use of selected colors in room and on equipment, and testing and correction (when needed) of workers' eyesight.

Lighting was improved in the 3,735-sq. ft. space (10 bays, 15½ x 24 ft., 16-ft. ceiling) by replacing direct lamps with semi-direct fixtures. The new pendant lights are 4-ft. long and contain two 40-watt, 3500° white fluorescent lamps mounted on either side of a reflector. Reflector is open on top and shielded on each side by a translucent plastic panel and by cross louvers below. It directs 16% of its light up, 41% down. These units were installed in 20 continuous rows, 7 ft. 9 in. on centers, five 4-ft. units to a row, suspended on 24-in. stems, with rows normal to length of room.

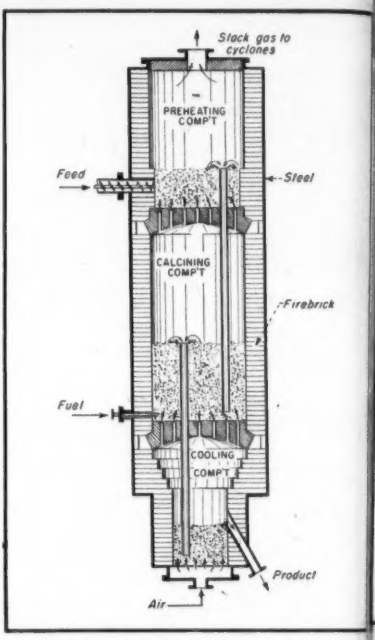
The room was completely conditioned for color control and to provide a more uniform background in the workers normal field of view. Colors used were: Machines, housings, writing shelf, etc., *medium-gray green*, 23% reflectance. Machine chassis, *dark gray green*, 15% reflectance. Walls, up to dado (8 ft.), *light blue green*, 50% reflectance. Trim, doors, sash, furniture, at walls, *blue green*, 15% reflectance. Acoustic tile ceiling, beams, upper walls, *off-white*, 70% reflectance. Floor, *tan* marbilized linoleum, 33% reflectance. Furniture, desks, chairs, tables, *medium gray green* with light linoleum tops, 23% reflectance.

Illumination efficiency was increased from 6.53 foot candles per watt per square foot to 16.73 after relighting, to 21.02 after painting, and was 18.01 after 3 months.

Total cost of project was 2.7% of annual payroll of department, and increased production paid for it in 6 months.—Elec C & M, D, 62



1 Adaptation of dense phase fluidization to the roasting of concentrates.



2 FluoSolids pilot kiln with three superposed fluid beds, for calcining limesto

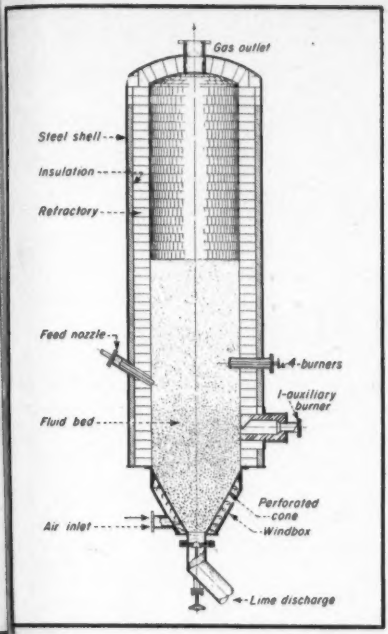
Fluidization in Non-Catalyti

Highly successful in various catalytic processes such as petroleum refini fluidization has been extended to non-catalytic fields, as limestone calcinati

In the past few years, fluidization has become firmly established as an important step in various catalytic processes. More recent research and development have progressed to a stage which definitely indicates the commercial acceptance of fluidization as an important unit operation in many noncatalytic processes, particularly in the chemical and metallurgical fields.

In fluidization, a mass of finely divided solids is maintained in a turbulent dense state by being dispersed in an upwardly moving gas stream. Most striking a vantage is the degree of temperature co trol and the uniformity of temperatu throughout the fluid bed; a maximu temperature differential of 25° F. betwe two widely separated points in a fl bed is not unusual. Similarly, the co position of the gas phase is subject extremely close control.

In calcination operations, the fuel co sumption is one of the principal econo advantages. With the close control, p processing objectives are attainable.



Calciner design being developed for by-product lime sludge of various industries.

Operations

Process has important advantages, some limitations. Plant has operated 1 yr.

Principal limitation is that there must be no softening or fusion, nor any surface adhesion, or agglomerates will be formed. Another partial limitation concerns the operating rate. Minimum gas velocity might be 75% of designed capacity and the maximum 125%, restricting the operating rate within these limits.

Eight Types of Processes

Operations of such general character as the following can be carried out advantageously by fluidization: (1) Calcination of materials, such as limestone, dolomite, magnesite, metal hydrates, and certain pigments; (2) partial calcination, as in reducing magnesium carbonate of dolomite to the oxide with only slight alteration of the calcium carbonate; (3) oxidation, particularly when it can be accomplished with air at elevated temperature; (4) reduction of metallic oxides, such as hematite to magnetite; (5) roasting of arseno-pyrites and sulphides of zinc, copper, and iron; (6) chlorination, including volatilization of metallic chlorides; (7) sulphatization such as conversion of copper oxide to copper sulphate; and (8) heat transfer operations wherein sensible heat is transferred from solid to gas phase, or the reverse.

Three Specific Applications

Adaptation of dense-phase fluidization to the roasting of arseno-pyrite concentrates is illustrated in figure 1. Concentrates are fed to fluid bed at a rate comparable to the air supply. If a depressed temperature is needed, water is injected. Calcine carried out by stack gases is recovered by cyclones. A roaster of this type has been producing 10–15 tons of product a day.

Application to limestone calcination is shown in figure 2, this pilot kiln having three superposed fluid beds. Top bed receives limestone (−6, +65 mesh) for preheating to about 1100° F. Preheated stone is transferred in fluidized state down tube to central calcincing compartment, usually at 1700°–1750° F. Due to displacement, the now burned limestone transfers to bottom compartment where it cools and preheats incoming combustion air. Fuel is unatomized Bunker C fuel oil, which is burned in the calciner without discoloring the final white product.

Calciner being developed for lime sludge is diagrammed in figure 3. It is for use in such industries as sulphate pulp, beet sugar, and water softening, which produce byproduct precipitated calcium carbonate.—Chem Eng, D, 112

This radio-frequency heating machine applies vertical and lateral pressure to a wood assembly.

Urea resin adhesives are used to assemble the Ford station wagon body. Bond is water-resistant.

More Effective Adhesives

Vegetable, protein, thermoplastic, and thermosetting adhesives are discussed. New applications and new developments increase use

Many new synthetic adhesives have been developed and are finding increased industrial applications. Addition of cross-linking agents to vinyl resins makes them thermosetting. This quality, plus the toughness of the resins, has extended the range of use. Special new silicone adhesives have extremely high heat resistance. Cost of synthetic resins is relatively high, but increased production and improved production methods should lower the cost.

In the field of synthetic resins, urea and phenolic glues are being used for plywoods and wood construction jobs. Of the synthetics, the polyvinyls are the most versatile, being used extensively for safety glass. Manufacturers of glass cloth laminates use unsaturated polyester resins.

Phenol formaldehyde is the most important and most widely used of the resins. It is extremely resistant to water, weathering, temperature variation, and chemical and bacterial action.

For wood, the synthetic adhesives have shear strengths between 1,000-2,000 psi.; for metals, phenolic elastomers' shear strength runs 4,000 psi. Rubber adhesives are relatively weak, but their shock absorbing action makes them more valuable than stronger adhesives for certain applications. They average about 50 psi. in shear strength when not vulcanized. Thermoplastics can be used to bond a wide variety of materials, but since they have a tendency to flow they are not suited for structural loads. For short duration, the shear bond for polyvinyl acetate averages 3,500 psi. for metal; 2,300 psi. for glass; 1,400 psi. for wood.

When phenolics are modified by the addition of rubbery compounds to form phenolic elastomers, strong bonds are made to metals and other materials that will withstand the heat and pressure necessary to form the bond. This lowers the modulus of elasticity so that there is enough elastic flow to compensate for differences in their coefficients of expansion. When used to join materials of different coefficients of thermal expansion, thermoplastic adhesives have sufficient plastic flow to prevent establishment of high stress under temperature change. But at low temperatures they lose much of their plasticity and their adhesive qualities are lowered.

Radio-frequency heating for curing glue joints offers many advantages. Rapid and relatively uniform heat is produced and with "parallel heating" the heat

generated in the glue line without appreciable moisture loss. Electronic heating can be used to heat curved assemblies, and it is much faster.

When used with room-temperature-setting glues, radio-frequency energy may be used to "tack" points of the joint, the remainder of the joint curing unaided. The chief disadvantage of radio frequency curing is relatively high cost of the equipment and the necessary power.

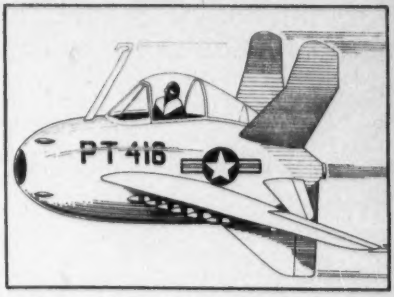
Animal and vegetable glues, widely used because of their low cost, are relatively weak. This weakness has restricted their use primarily to wood and paper where there is a minimum exposure to weathering. Excessive moisture or dryness tends to deteriorate these glues.

Applications

Wood Construction—Where exposure to moisture and/or fungi is possible, thermosetting resins should be used. Light-colored urea glues should be employed for work calling for matching woods; resorcinol and phenolic glues tend to cure dark. For indoor applications, low-cost animal and vegetable adhesives will suffice.

Metal-to-Metal—Development of metal-to-metal adhesives was spurred by the aviation industries. They are based on phenolics, modified by synthetic rubber or resins. Where these adhesives are used in lap joints to replace rivets or spot welds, optimum area is a consideration. Thickness of the metal and length of the lap are factors limiting the application of adhesives. When thin metal sheets are cemented together, joints usually have greater tensile strength than riveted joints but tend to peel. To overcome the latter, ends of the joints often are riveted.

Wood-to-Metal—These are outgrowths of the metal-to-metal adhesives, having low density and high strength-weight ratios. Metal-clad plywoods (see McG-H Digest, Jan, p. 26) made with phenolic adhesives are being used increasingly. Procedures for bonding are: (1) Metal adhesives on one face with wood adhesives on the other, single-stage process. (2) Adhesive-coated metal surface, two-stage process. (3) Film adhesive, interlaid in joints, especially for plywood. (4) Nonplywood applications, as solid wood to metal.



PARASITE PLANE—This tiny 2½-ton parasite fighter, designed for use with the B-36 bomber, will be test flown soon. Designated the XP-85, it has no landing gear and will be retrieved by the mother ship by a "trapeze." Wings are folded for storage and are opened on the "trapeze." Powered by a Westinghouse 24C turbojet, developing 3,000 lb. static thrust, the plane has a top speed of over 650 mph. Rate of climb is described as "tremendous." Extremely short fuselage and wings aggrevate greatly the plane's stability.—Aviation Wk, D 1, 14

Glass—Largest use is in safety glass, a clear thermoplastic such as polyvinyl butyral being employed. High modulus of elasticity and brittleness of glass excludes the use of any thermosetting plastics.

Plastics—Thermosetting plastics, having a high modulus of elasticity, are in the same class with metals and glass. Thermosetting or thermoplastic cements modified to give low modulus of elasticity are used for joining.

Textiles and Paper—For waterproof, mildew-resistant paper packages, heat-sealing polyvinyls are excellent, though expensive. In paper adhesives, strength of the adhesive is of secondary importance since the strength of the paper is low.—Prod Eng, N, 117; D, 137

WESTINGHOUSE SIMPLIFIES MOTOR MANUFACTURE

All sizes of steel stator frames and brackets for the new Life-Line 1-15 hp. motors of Westinghouse Electric Corp. are fabricated by automatic ac. submerged-arc welding. Full automatic control is achieved through cams, micro-switches, and solenoid air valves. All work is rigidly held in fixtures to maintain shape and dimensional requirements.

Motor frames are made from ⅜-½-in. rolled mild-steel plate, 9-12 in. wide, up to 22 ft. long. Punch presses cut pieces to length and pierce lead-wire holes in one operation. Hole edges are beveled by a coining press with double-acting die. Cut plate is cold-rolled into circles on a heavy-duty, through-roll machine and frames are automatically ejected. Frame seams are welded, feet are welded on, and holes are drilled and tapped for conduit box. Stator lamination core is built up and assembled to frame, complete with locking bars, in a triple-action press. End brackets are made up of drawn steel bell and hub welded together.

Careful design reduced the number of component pieces for entire motor line from 2,800 to 126.—Am Mach, D 4, 106

TRUCK PRODUCTION IS CATCHING UP

Manufacturers of heavy trucks, above 24,000 lb. gross vehicle weight, find a buyer's market developing. Prospective purchasers are holding out for trucks closer to their desired specifications. But the demand for vehicles is still high, especially among fleet operators. Percentage-wise, the price of heavier trucks has not risen as high as prices in the light- and medium-weight groups.

In the 9,000–24,000-ton gross vehicle weight class, truck manufacturers are feeling a boom, but again buyers are becoming specification conscious. Studebaker, for instance, now is producing in one month what it produced in a prewar year. In the medium-truck field, the largest proportional gains are being made by those manufacturers just behind the leaders. Manufacturers feel their future markets primarily will be new uses, not replacements, which are slowly catching up with demand.

Production of light-weight trucks, below 9,000-lb. gross vehicle weight, is still below demand, and the end of the backlog is not in sight. This situation is aggravated by the fact that these trucks require about the same amount of steel as passenger cars. In the past year, half a million units were produced. Plant improvements promise an increased production if the necessary steel is available.—Business Wk, N 29, 28; D 6, 41; D 13, 46

TO PRODUCE ACETYLENE GAS BY ELECTRIC GLOW PROCESS

Acetylene gas will be produced commercially by the electric discharge process at Houston Oxygen Co. The new plant consists of an electrical control section, a reaction section, and a concentrating section. Electrical equipment is standard. Natural gas is piped into the reaction chamber at 300°F. An electrical discharge is passed through it at atmospheric pressure, the charge coming from two rotating electrodes.

Gaseous products are acetylene, 10%; hydrogen, 40%; and methane, 50%. Carbon black is also produced and is removed by filters. Gases are compressed and passed through an oil bath to remove hydrocarbons. Then they pass to a solvent extraction unit, the acteylene dissolving and the methane and hydrogen being recovered for fuel. The acetylene is 99% pure. Cost is expected to be 4-4.5¢ a pound, or less than that of acetylene from carbide.

Carbon black yield is 1½ lb. per 1,000 cu. ft. of natural gas. If the acetylene is converted to carbon black, the yield could be raised to 10½ lb. per 1,000 cu. ft. —Business Wk, D 6, 78; Elec World, N 29, 21

RADIO RELAYS are assembled from parts dispensed by this simple hopper which replaces separate boxes for each part. Simple jig holds the assembly. Arms do not have to stretch beyond normal work area. Operator can use both hands simultaneously. Production was increased 25% after installation of the hopper.—Factory, D, 100

COLLATION of pages for books or pamphlets is simplified by this $10 cabinet, saving 65 man-hr. per five hundred 400-page books. Thumb and first finger hold while middle finger pulls out pages. Hands move up the rows of shelves, both hands being productive.—Factory, D, 93

Jobs Simplified

EFFICIENCY is just as applicable to the office as it is to the production line. This horseshoe-shaped desk puts inventory control records within easy reach of the clerk. Records are on swivels so they are accessible from either side of the counter. Clerical time is saved and less space is required.—Factory, D, 100

VICE-PRESIDENT'S OFFICE LIGHTED FROM FOUR SOURCES

OVER THE DESK, a flush panel of lightly etched plastic tiles shields six 40-watt fluorescent tubes, switched separately in pairs. Narrow ceiling band of light houses pairs of 42-in. Slimlines in parabolic reflectors. Portable lamp combines a 12-in. Circline with 3-way filament bulb. Upper halves of windows house shallow white-lined boxes with four 42-in. Slimlines crosswise. Opening or closing of venetian blind regulates light.—Elec World, D 20, 65

GOOD EMPLOYEE RELATIONS MORE THAN DOUBLES OUTPUT

An improved employee relations program at Porter-Cable Machine Co. raised perman productivity from $4,500 in 1939 to $10,500 by the end of 1946. The company gives the plan full credit for the rise; 375 people are employed.

Operating under a plan of decentralized management, a multiple management group, consisting of executives, supervisors, foremen, group leaders, and production workers, assumes management's responsibilities. A 10-man labor-management committee—7 from labor, 3 from management—meets semi-monthly to discuss problems and company policy. New labor representatives are elected semi-annually.

In 1941 the company established an employee's club room. Now it operates at an annual net profit of $5,000. Management and employees use the club facilities jointly. The profit-sharing plan in 1946 gave each employee a 10% bonus. A pension plan, suggestion system, and individual incentives are part of the program.

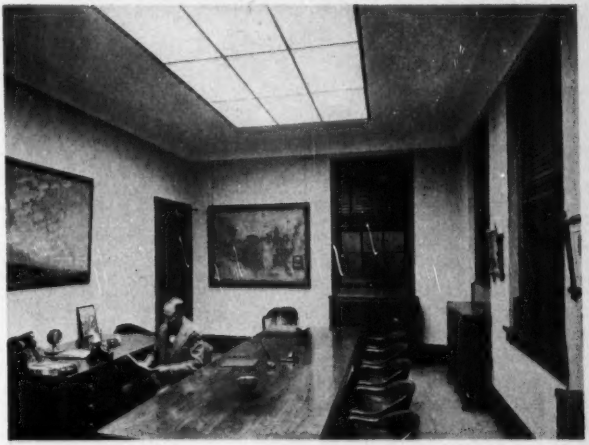
For 15 min. each morning and afternoon, records are played in the factory as a relief. Results of this phase of the program are difficult to determine. The program as a whole has combatted high costs and low productivity and has fostered individual enthusiasm and morale.—Factory, D, 78

TRAVELING QUICK FREEZER

Designed to move from one area to another as local food crops become ready for harvest, a new mobile quick freezer extends the operator's processing season for a more profitable business. The plant consists of two railway cars. One is equipped with an air-blast freezer, and the other is a 0°F. storage car. The refrigerating machinery is mounted in a highway truck-trailer which can be parked near the freezing and holding cars. The traveling plant is placed on a railroad siding, and the products are prepared and packaged in a nearby screened-in packing shed.

Capacity of the Transit Freezers unit is 2,000 lb. per hr.—Food Ind, D, 98

. . . SALES MANAGER'S OFFICE HAS LARGE CEILING PANEL



SINGLE CEILING panel (6½x14½x1 ft.) gives two-level lighting (100 and 200 fc.) in 326-sq. ft. room. Overall fixture area of 94 sq. ft. is shielded by diffusing glass. A total of 52 instant-start, 6-ft., 4500° white Slimlines are used, on two separately switched circuits. Lighting is geared to type of work done in office. Eye comfort and smoothness are principal considerations. — Elec World, D 20, 65

NEW EQUIPMENT SPEEDS TEMPLATING AT BOEING

New equipment and methods in the photo-templating section at Boeing Aircraft Co. have resulted in greater production with reduced manpower in less time. An automatic sensitizing machine is the heart of the new system. Aluminum, sheet steel, or plywood sheets, on which templates are photographed, are fed into the machine by an overhead conveyor at 3,000 sq. ft. per hr. A vertically-moving spray gun, synchronized with the speed of the conveyor, sprays a strip of photographic emulsions 8 to 10 in. wide and 0.005-in. thick on each vertical trip. Sensitized sheets are kept in the dark from spraying to the time they are placed on the camera easel.

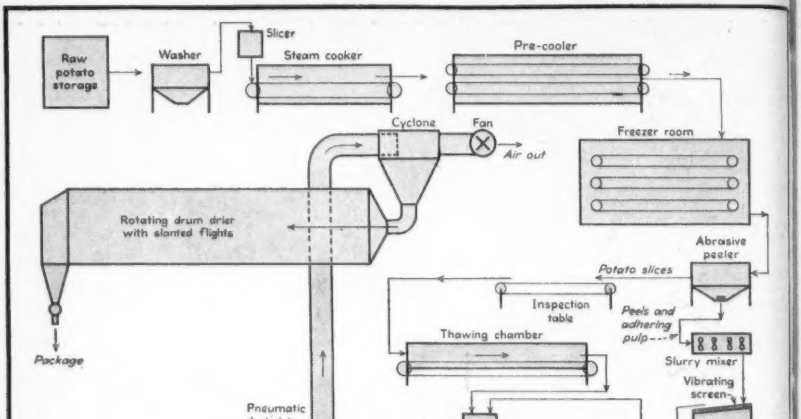
Master drawings, on 0.038-in. steel covered with as many as nine coats of white paint, are photographed with a Lanston Monotype camera. In making a template, negative is projected back onto the easel, the image being "trammed" to scale and the exposure made on the sensitized sheet. From the camera, the sheet goes to the processing room where it is developed, fixed, and washed. Monorail carries sheet through a double bank of infrared drying lamps.

A silver stylus is used for drawing, making a sharper line than a pencil. A traveling lamp gives minimum light reflection from the silver line. Aluminum templates are being used to replace steel ones, since one man can load the lighter templates onto the conveyor.

Another Boeing innovation is the use of 0.003-in. shim stock for changer stickers. Now changes in design can be made on shim stock and cemented to the old template.—Aviation Wk, D 1, 20

CERAMIC-TO-METAL SEALS

A promising but little known type of gasketless seal for many industrial products now using gaskets is the soldered ceramic-to-metal seal employed for cable terminals, bushings, and connectors. A film of metallizing compound is applied to ceramics and bonded by firing. Silver soldering attaches the metallized ceramic to metal.—Prod. Eng, D, 154



FLOW SHEET of most efficient of two processes for producing high-quality dehydrated potato granules. This process involves peeling after freezing.

Better Dehydrating Process

Excellent mashed potatoes quickly prepared from potato granules made by radically new process involving freezing, centrifuging, and dehydrating

One of the outstanding postwar developments of the food industry is dehydrated potato granules which rehydrate "instantly" to form light, fluffy mashed potatoes, completely free of lumps or pastiness. Somewhat revolutionary, the process involves freezing, and thawing, followed by mechanical removal of the bulk of the moisture.

Freezing toughens the starch-bearing cell structure and permits subdivision of of the potato into granular size without cell rupture. If cells are ruptured, the rehydrated potato is gummy and sticky. Mechanical removal of moisture is simple, and effective, and it makes the potato dry enough to be granulated through a screen.

Two Processes—Being continuous, the new dehydrating procedure conforms to the most economic practice. There are two different processing arrangements. In the conventional one, the raw potatoes are mechanically washed, peeled, trimmed, and cut into ¾-in. slices. Then they are cooked, frozen, thawed, 50% dried by pressure, granulated through a screen, and flash dried in a hot air stream.

A radical variation of this procedure, illustrated in the flow sheet, increases yields by salvaging pulp losses and by eliminating hand trimming. Production

costs are remarkably low. The potatoes are washed (but not peeled), sliced, cooked, frozen, then peeled and trimmed mechanically by slight abrasion and simultaneous water spray. The peeler can be almost identical to a rotary washer, the tumbling action giving the necessary abrasion, while the water spray thaws the outside. Skins and eyes come off easily; trim table operations are eliminated. The lost pulp is salvaged in a slurry process. Peels and adhering pulp are collected in 2% brine which inhibits cell rupture. The mixture of peel and brine enter an agitator which churns the pulp to a slurry from which the peel is removed by a 16-18 mesh stainless steel screen and discarded. Pulp settles out in a stainless or galvanized tank and is returned to the process for centrifuging, granulating, and drying.

Cooking—Slices are cooked about 30 min. at 210°F. in a continuous atmospheric steam cooker. Under- or overcooking has a tendency to rupture cells.

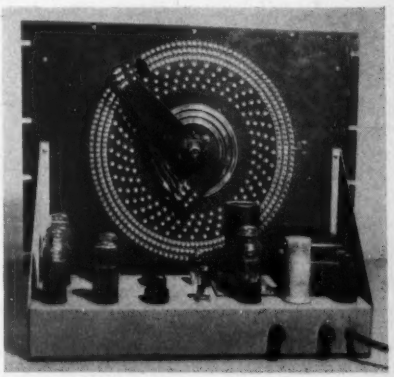
Freezing—Cooked slices are precooled and frozen solid in a continuous freezer, or in freezing room at 25°F.; quick freezing is not desirable. The precooler can be a simple cooling tunnel with continuous conveyor. Frozen potatoes have been held 30 days without quality deterioration.

Thawing—Warm air is circulated over the slices, as they leave freezer, to thaw them. Too rapid thawing softens cells. Economy in thawing is attained by heat interchange—cooling the cooked mass and warming the frozen mass by counterflow.

Drying, Granulating—Either a press or a centrifuge may be used for partial drying, the latter being preferred from an operational viewpoint. Pressure need not exceed 50 psi. Granulating is done by paddling through a screen in slightly modified standard machines. The final dehydrator need be nothing more than an air-stream duct through which granules are blown for almost instantaneous drying and collected in a cyclone, a rotary drum air dryer, or a combination of the two. Moisture content of 3%, with only 2% cell rupture, has been attained with a drum drier. Rupture of 6-12% can be tolerated.

Costs—Capital investment for a 1,000-lb.-per-hr. plant is estimated at $70,000. Production cost is placed at 6.75¢ per pound, including packaging and amortization. With new potatoes at 75¢ per cwt., and a raw-dehydrated ratio of 5.5 to 1, total cost is 13¢ per lb. Adding selling costs indicates a retail price of 25¢ per dry pound.

Reconstitution—Ready-to-serve fluffy mashed potatoes are prepared instantly by adding 1 part granules to 2¾ parts (volume) of boiling water or milk. Flavor is comparable with that of fresh mashed potatoes; shelf life is long.—Food Ind, D, 86

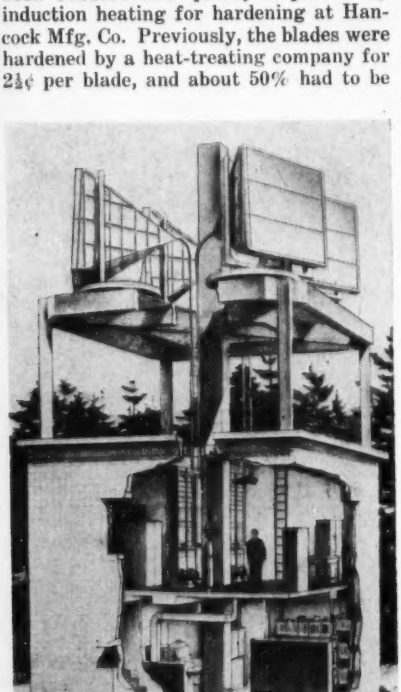


SPEEDY RESISTANCE TESTER—Developed to serve as a master test position on assembly lines for electronic equipment, a new limit bridge automatically compares the resistances of as many as 120 circuits with those of precision circuits in a standard chassis. Amplified output of a bridge is converted to square waves and applied to a thyratron whose bias is set for required acceptance tolerances, this thyratron operating a reject indicator. Tester uses a 3-gang, 120-position, ratchet-driven switch (above), arranged to step once per sec. Tester can be set up in 15 min.—Electronics, Ja, 110

INDUCTION HARDENING REDUCES BLADE COSTS

Cost of hardening grass shear blades has been reduced and quality improved by induction heating for hardening at Hancock Mfg. Co. Previously, the blades were hardened by a heat-treating company for 2½¢ per blade, and about 50% had to be straightened because of distortion. With a 10-kw., 450-kc. radio-frequency heater and automatic work-handling equipment, hardening costs 1¢. There is no warping because only the cutting edge is heated.

Initial investment for rf. generator and handling equipment was about $7,000. Operating costs, exclusive of labor, are about 61¢ per hr. This includes power at 1.5¢ per kwh., tube replacements based on 3,500–5,000-hr. average life, and 17-yr. amortization of generator and equipment. —Am Mach, D 18, 91



RELAYS TELEVISION—Cut-away view of typical radio relay station for television. Horn antennas on top with metal focusing lenses provide a total gain of 100,000,000 per hop. Emergency power equipment and storage batteries are on first floor. Four microwave repeaters, two for each direction, are on second floor, with waveguide feed to antennas. A new seven-station relay system has been installed on 220-mile route between New York and Boston. Operating in 3,700- to 4,200-mc. band, it provides two 5-mc. channels in each direction.—Electronics, Ja, 114

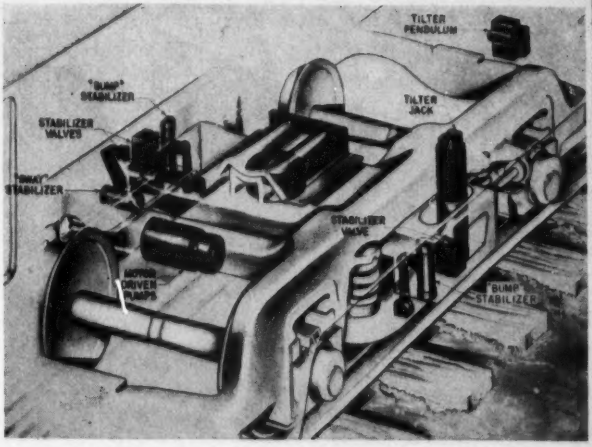
MINING INNOVATIONS

Innovations in mining were revealed at the recent American Mining Congress. Getchell Mine, Inc., reported that a 100-ton pilot plant recovering gold from cyanide pulp with carbon contained in fine screens has been in successful operation for 4 months. . . . American Cyanamid Co. reported that about 2,000,000 tons of ore is being handled monthly by heavy-media separation—including iron, zinc, fluorspar, magnesite, garnet, tin, and lead-zinc. . . . Labor-saving devices, automatic controls, and regrind circuits to obtain concentrates which reduce smelting costs have enabled Southwest copper producers to treat 87% more ore than in the 1914-1918 period.—Eng & Min J, D, 84

SUPERIOR FOOD STABILIZER

Clearjel, a better stabilizer for many processed food products, has been made from waxy maize by National Starch Products, Inc. Noncohesive, it produces fine-textured fruit pie filling with soft jelling, creamy properties; its clarity makes the fruit attractive; unappetizing shrinkage does not occur. It also is useful in confections, chop suey bases, cream sauces, and clear gravies. This new starch consists entirely of amylopectin. It resists breakdown on prolonged cooking, and recovers its original body and texture after freezing.—Food Ind, D, 1

SMOOTH RAILWAY RIDE — Smooth railway rides are promised with new Westinghouse shock absorber. Six hydraulic cylinders — four for vertical bumps and two for side sway — are mounted between wheels and body. Slight bumps open one valve and close another, causing high-pressure oil to flow into proper cylinder to hold the car steady. It takes 0.0003 sec. to act. On curves, a gyro-controlled pendulum device actuates proper jack to tilt body to correct angle. — Business Wk, D 13, 62



MOUNT 48-IN. LOOM BEAM ON STAND ABOVE LOOM

A loom beam, 48-in. in dia. when filled, mounted on a stand above the loom has been in experimental use at Pepperell Mfg. Co. The experimental beam takes no more floor space than those located in standard position. The mill reports that changes of warps are reduced.

Advantages of the high mounting are: fixer can reach parts under loom easier, loom is easier to oil, loom can be blown off without getting oil on warps, and floor under loom is easier to clean. Disadvantages are: cost of installation, need to rearrange lighting, and increased work for weaver when an extra end comes down on the beam.—Textile World, D, 135

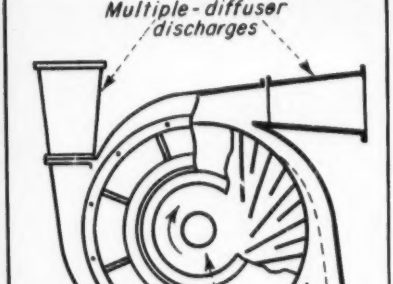
SPLICING A HI-LINE HOT

Ohio Power Co. safely spliced a pole-mounted 66-kv. electrical power conductor without deenergizing the line. Tension on conductor was transferred to link sticks and comealongs by ratchet screw supported from top crossarm on pole, a jumper being installed around burned section of conductor for safety. Conductor was cleaned with abrasive cloth reciprocated by sticks, then damaged section was removed by a hot-wire cutter. End of line was inserted into sleeves on ends of new piece of conductor, sleeves being compressed with roll-type splicers having wood handles.—Elec World, N 22, 78

VOLTAGE AND RADIUM SPOT DEFECTS IN BIG PIPE

Faults in the protective coating of a large gas pipeline being laid from Texas to southern California are located with an electronic detector. The device impresses a 5,000-volt potential across the coating. When a weak spot is encountered, a spark jumps through and energizes a bell alarm, light indicator, and counter. As much as 2,000 ft. per hr. can be tested.

Gamma ray test pictures are taken of about 10% of field welds on the line. A radium capsule is inserted in pipe and films applied around weld. A set of lead numbers denoting inches also is wrapped around pipe to facilitate locating defects appearing on film.—Electronics, D, 176



BETTER COMPRESSOR — Feature of a 1000-kw. gas turbine plant which has passed initial tests in Switzerland is a more efficient centrifugal compressor. Four outlets (above) raise efficiency from 76% to 88%, with same impeller. Centrifugals have these advantages over axial-flow compressors: (1) Relatively flat pressure-volume characteristic; (2) greater range of operation before reaching pumping limit; (3) greater flexibility in intercooler installation.—Power, D, 103

AID FREIGHT CAR ASSEMBLY

All welding is downhand on 40-ton hopper cars at American Car & Foundry Co. since rotating positioners have been adopted. Car fabrication also is facilitated by the following subassemblies: center sills with draft attachments and ties; upper floor sheet, hopper chute floor sheet, and body bolster beam; crossridge with cross-bearer; side sheets with top bulb angle posts, side sills, bolster posts, and intermediate posts; and end sheet with top bulb angle posts, ladder stile, end sill brake platform brackets, and hand brake.—Weld Eng, D, 62

MUCKING MACHINE REPLACES TIMBER CHUTE IN MINE

Substitution of a mucking machine for the timbered chute has been made by Copper Canyon Mining Co. with good results. Mucking machine trackage was laid obliquely to haulage tracks. Loading is with a rocker shovel, the operator hooking up each car and loading endwise. Loaded cars are switched onto main line and made into six-car trains.

This system was modified in a new sublevel stope, draw points being employed. Crosscuts 20-25 ft. long were driven perpendicular to haulage way. At the end of each crosscut, a finger raise was blasted out, and belling out of the undercut was started to connect finger raises of other draw points. Turn sheets move mucking machine into loading position, eliminating switching and uncoupling of cars.

Advantages of the new system are: (1) Less labor, since grizzly man is eliminated and mucking machine operator replaces chute tapper. (2) Cost of draw points is less. (3) Production is not delayed while crosscuts and finger raises are being constructed. (4) In firm ground, little upkeep is necessary. (5) Undercutting of stope above can be started at lower level, making more ore available. (6) Better ventilation results on main line. (7) Primary breaking can be reduced. (8) Method is safer, eliminating many of the accident hazards.—Eng & Min J, D, 58

RADAR FIRES FLASH BULBS

Foil- or wire-filled photographic flash bulbs can be ignited by radar, according to tests conducted by the U. S. Army. In a demonstration, all of 3,000 bulbs were ignited, only 12% of the batch withstanding the radar bombardment for as much as a minute. As a result of the test, major bulb manufacturers have ceased shipments of bulbs by air.—Business Wk, D 6, 60

What's New in Welding

Fast tube welder, ingenious copper-bar process, modified submerged-melt welder, new type of pressure welding and novel resistance welder, developed

An ingenious copper-bar welding process developed by the Germans is effective for long fillet welds or long butt welds. The plates are aligned and insulating paper placed over them. A long electrode (3-15 ft.) is positioned on paper along edges of plates, then another strip of paper is placed over it. A grooved copper bar is placed over the electrode to shield it and enclose it when it melts. One end of electrode is connected to a conventional type holder. The other end is touched with the carbon arc to melt a portion and allow it to reach the work. The electrode is consumed gradually, and once the process is started it requires no further attention from the operator. The same polarity and about the same current settings are used as in manual arc welds.

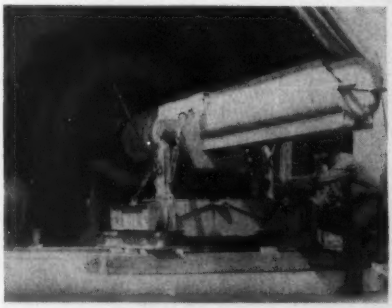
Speeds as high as 200 fpm. are attained in continuous welding of tubing seams by a new machine using 125 oxyacetylene-welding heads. Introduced by Air Reduction Sales Co., the equipment is limited to ¼-⅜-in. tubing, but models are in prospect which will handle 1-in. tubing at speeds up to 500 fpm.

Another type of semiautomatic welding using a modified "hidden" arc (submerged melt) has been developed by Lincoln Electric Co. With this equipment, current setting, rate of feed, and arc length are automatic, but the operator has full control of welding speed and direction. Hidden-arc equipment can be used to join steel of poor weldability without preheat or to deposit alloy overlays on mild steel. Mill rolls weighing 83,000 lb. have been rebuilt with metal deposited automatically.

A different type of oxyacetylene pressure welding has been developed by Canadian Liquid Air Co., Ltd. The weld faces are heated to melting temperature before the pressure is applied. No edge preparation other than removal of scale and rust is required. Heating time (5–10 sec.) is very short in comparison with solid-phase pressure welding.

New research shows that, contrary to prevailing belief, pulsation welding offers no advantages for spot welding steel plates ¼ to ½ in. thick. Continuous welding, on the other hand, was found to offer several advantages, such as simplified control and elimination of rapidly fluctuating voltages. A low-current, high-pressure preheat was effective in obtaining intimate contact between sheets and in minimizing short circuiting.

A new type of stored-energy resistance



EASY HEAVY HANDLING—Time required for removing 56-ton generator rotors at Bonneville is reduced from 7 to 2 days by special handling equipment. Fewer men are needed, and operation is safer. One end of shaft is supported by yoke on jacks, so bearing and pedestal can be removed. Then shaft extension is installed, and rotor weight is taken on jack-carriage assembly. Other end of shaft is supported on yoke and jacks, bearing and pedestal are removed, and rotor weight is taken on carriage. Then fan is removed, weight being taken alternately on yoke jacks and carriage jacks. With carriages at each end, entire assembly is moved endwise until rotor is clear of stator.—Elec World, D 6, 84

welder developed by Progressive Welder Co. uses a simple ac. motor, a homopolar generator, a carbon-pile contactor, and a flywheel. The generator, a type little used since Faraday, produces continuous direct current of high amperage and relatively low voltage, just what is needed for resistance welding.

Welding of odd shapes by the submerged-melt process can be done by mounting a welding head on an oxyacetylene shape-cutting machine. The combination has been used in making a square weld to seal the ends of marine boiler headers.

Both aluminum and stainless steel beer barrels are being welded by the inert-gas process.—Weld Eng, D, 33

HANDY LIQUID PLASTIC

Neither heat nor pressure is needed to cure the new Phenoplast phenolic resin coating material developed by Lockrey Plastic Products Co. Applied to almost any type of surface by brush or spray, it can be used on floors, furniture, boats and so forth. It will make bottles or caps of other plastics resistant to oils and solvents. It can be employed to impregnate fabrics for forming into experimental plastic automobile bodies, etc. Other uses include waterproofing of plywood and insulating all but the tips of electrical instruments.—Chem Eng, D, 184

ISOTOPES SOON TO BECOME PRODUCTION TOOL

Radioactive isotopes soon will cease to be a research tool of industry and become a regular production tool to analyze materials and control processes. It is expected that isotopes will find use soon in the production of alloy steel. One manufacturer has completed test trials with titanium steel. When a trace of radiotitanium is used, the amount of titanium in the metal can be determined more rapidly and accurately than by chemical methods. Radio-sulphur added to steel will permit simple measurement of slag to determine how much of the sulphur impurities has been removed.

Westinghouse Electric Corp. is using isotopes to make studies in fundamental metallurgy. It is trying to determine why some metals are brittle, how metals age, and what goes on during corrosion. —Business Wk, D 6, 56

SOUND FILM FOR HOME

Working similarly to a portable phonograph, the new Phonovision Corp. of America home sound-film projector uses a record revolving on a turntable. Film is locked in a can and the record locked atop the can, the entire assembly being placed on the turntable. A tone arm picks up the sound. A projector lamp throws a beam of light through an opening and into the can, and a series of mirrors pass the light through the film and out of the projection hole in the opposite side of the can. Film is viewed either on a small glass screen on the projector case or on a conventional screen. Unit will sell for $150.—Business Wk, N 29, 20

GRAB CARRIER—Packages of sheet steel weighing up to 3 tons are moved at American Bantam Car Co. by this grab carrying device. It permits moving 40 tons of packaged steel from receiving dock to warehouse in 2 hr. Carrying device is substituted for the fork lift truck's fork in 2 min.—Factory, D, 126

HOW DESIGN FACTORS AFFECT ELECTRIC MOTOR NOISE

Quiet motors are increasingly important for satisfactory performance. Analysis shows motor noise to be a complex of magnetic, ventilating, and mechanical noises.

Contributing to magnetic noise are little irregularities in the winding or the machining of parts, unfavorable ratio of number of slots in rotor and stator, and none or too little beveling of slots.

Ventilating noise increases with diminution of the air gap between fan and casing. Small diameter fans with more blades of equal pitch give lower noise level; the aero-foil section is the best blade profile.

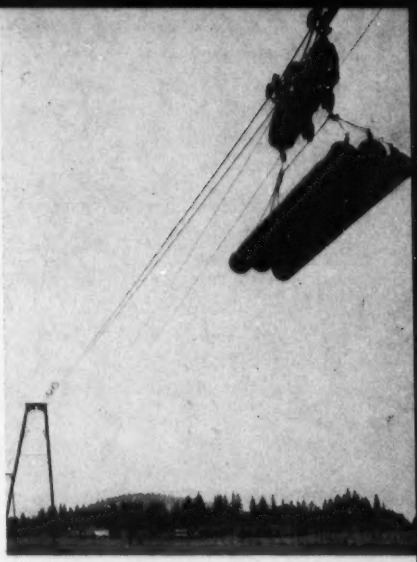
Mechanical noises are produced by nonbalanced rotating parts that vibrate nonrigid parts; antifriction bearings in which balls and rollers knock on the cage and raceways; and by brushes knocking on the commutator and brushholder walls. Brush noise increases with degree of machining of commutator surface, with brush pressure, and with tight fit of brushes in holders.

Kind of current has little direct influence on motor noises.—Prod Eng, D, 110

MUSIC FROM LIGHT

Keyboard pattern projected on the wall by a miniature projector produces organ-like music when light beams are intercepted by the Leslie Gould photoelectric wands. Source of music is a rotating transparent plastic disk placed in the projector. Concentric circles of diamonds and zigzag lines interrupt light beams at musical frequencies. Each circle produces a separate organ note. Connected to a loudspeaker through an amplifier, the photoelectric wands convert the flashes of light to musical tones.

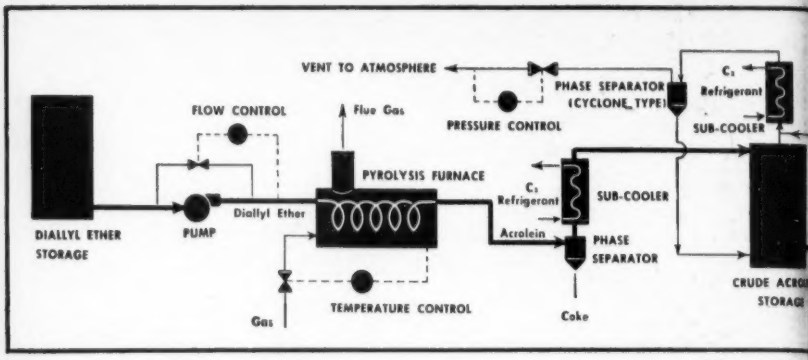
The Prismatone electric organ is played like a marimba, with two or more wands used to control chords.—Science Ill, D, 86



SKYHOOK CARRIAGE—Big pipe sections for 1,050-mile Trans-Arabian oil pipeline will be transported over several installations of new Pointer-Willamette Skyhook. First use will be to carry pipe from ship-unloading point on artificial island offshore to point 20,000 ft. inland. Originally developed for Northwest logging operations, 20-ton Skyhook consists of a carriage riding a pair of fixed cables supported on two-leg towers, 500-2,000 ft. apart. Powered by 115-hp. gasoline engine, carriage is propelled by pair of fixed drive cables wrapped around four drive drums. Hoist drums carry load. Operator rides carriage.—Cons Meth, D, 99

MAPS AID MINE SAFETY

At the 20,000-ton per day block caving mine of Andes Copper Mining Co., Chile, fire maps of various mine areas have been prepared, with special instructions for action in case of fire. These are carried by all mine supervisors and safety personnel. Instructions give details for actions at all points in the mine. They provide for control of the fire and escape of personnel. Mine safety section consists of 27 specially trained men, identifiable by white helmets.—Eng & Min J, D, 69



Acrolein Made Commercially

Shell Chemical Co. perfects new process for producing versatile chemical building block on large scale for use in various industrial products.

For a hundred years chemists have tried to devise methods for the commercial production of acrolein, an extremely reactive and versatile chemical building block. At last the problem has been solved. Shell Chemical Corp. has developed a method and installed a commercial unit.

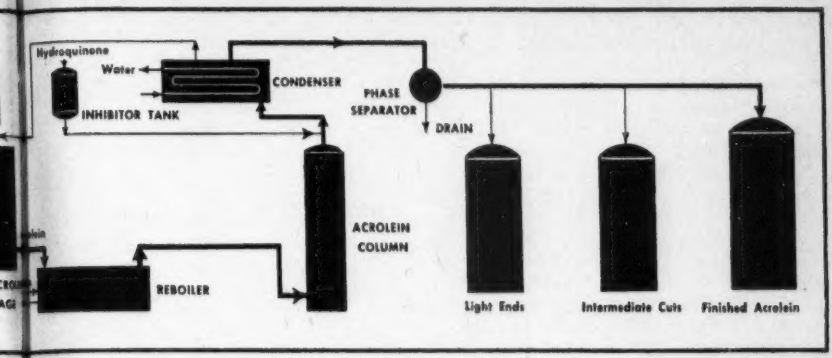
Commercial production was started in response to demands from several manufacturers of resins, insecticides, pharmaceuticals, and chemical intermediates.

The process involves the thermal cracking of diallyl ether (produced as a by-product of allyl alcohol manufacture), followed by distillation of the crude product to produce 96-98% pure acrolein.

The exothermic conversion is carried out by non-catalytic pyrolysis at 30 psig. and 970°F. Acrolein is found in the pyrolysis product to the extent of 86 mol. percent of the diallyl ether converted. Also formed are carbon, hydrogen, water, and propionaldehyde, as well as about 5 mol. percent of heavy ends.

The hazardous nature of acrolein and its tendency to polymerize were taken into consideration in the plant design. Materials containing acrolein are transferred by natural gas pressure, rather than by pumps, to minimize sources of leakage and fume problems. For similar reasons, distillation reflux is obtained through the use of liquid head from elevated condensers. To exclude air, storage vessels are blanketed with natural gas. Pressure-relief valves, which are protected by rupture disks to prevent sealing by polymer, discharge into a common vent line and a 60-ft. stack. To prevent accumulation of liquid acrolein, the vent stack base is sealed by a lute purged by continuous flow of water. Since no corrosion problems have been encountered, construction is uniformly of mild carbon steel.

After the liquid diallyl ether is converted to acrolein in the furnace tube, it passes to a cyclone separator for removal of coke, then to a water-cooled condenser (85°F.) Uncondensed gases are separated in a crude storage vessel and pass through a propane refrigerated sub-cooler, which reduces gas stream temperature to 35°F. and acrolein content to 4%. The liquid acrolein is returned to



Flow sheet of new process for producing acrolein commercially

After 100 Yr.

Hazardous nature of process requires special processing techniques

the crude surge drum through a liquid seal and the propylene stream is vented to atmosphere. A backpressure regulator maintains 30 psig. on entire crude acrolein system.

After reboiling, acrolein finishing is performed batchwise in a 12-in. diameter column with a 40-ft. section packed with 1-in. ceramic Berl saddles.

In the distillation system, propylene is removed in a "degassing" step. Column pressure is raised to 30 psig., then a line to the crude system vent gas subcooler is opened. The column then operates at furnace-system pressure until propylene is removed. Acrolein condensed from this stream returns to the crude accumulator. Degassing requires about 1 hr. When liquid reflux is established, the distillation column is isolated from the crude system and cooled to atmospheric boiling temperature of acrolein.

After degassing, a light-ends fraction is removed and accumulated. This cut contains the major portion of the propionaldehyde, water, and a high concentration of acrolein. Acrolein recovered in subsequent distillation of the cut is returned to crude; light-ends concentrate is burned.

Removal of light ends is continued until a top product acrolein assay of 90% weight is reached. An intermediate cut to 90% purity is segregated for preparation of the hydroquinone inhibitor solution. Above 96% purity, the top product rate is increased and reflux reduced, finished acrolein being produced and directed to storage.—Chem Eng, D, 106

SCOPE OF SPINNING FRAME BROADENED BY NEW UNIT

The productive scope of the ring-spinning frame is broadened by a French type machine developed by McGlynn Hays Industries, Inc. It produces a range of yarns from 1/10s to 1/90s. Operating costs are reduced through high-speed operation and larger packages, and necessary floor space is reduced. Optimum balloon length is maintained throughout the building of the package by rigidly mounting the rotating spindles and driving cylinders and by gradually raising the rotating fiber-control draft mechanism 5 in. during building.

Drafts as high as 20:1 have been used, but the manufacturers recommend 15:1 as best.—Textile World, D, 155

BUILDING-FIRE EQUIPMENT BAD FOR AIRPORT FIRES

For combatting aircraft fires, conventional building-fire fighting equipment is all but useless and in many cases is detrimental, according to the Civil Aeronautical Authority. For plane fires occurring at airports, special equipment and adequately trained personnel are necessities. The AAF during the war developed a "fog" truck used to quiet the fire and permit rescuers to enter the plane and bring out trapped passengers. The finely discharged water is under 600-700 psi. pressure, developed by a special pump. The water fog cuts off oxygen to the blaze and has a high heat-absorbing action.

The Navy found foam and CO_2 the most desirable agents for fire fighting, based primarily on small fires aboard carriers. The Navy truck carries three tons of CO_2 under low pressure and 400 gal. of foam.

At the CAA-operated National Airport, Washington, adequate fire protection is provided by four trucks and three shifts of fire-fighters. Crews for the two night shifts are drawn from the airline personnel "on the line," but the crew chief and truck drivers on both shifts are full-time, fully trained men.—Air Trans, D, 30

GOOD NAP IN MINIMUM RUNS

Close control of raw cotton, grey goods preparation, and adjustment of napper working parts enables Dundee Mills to to produce top-quality flannel with a minimum number of runs through the napper. Long-staple cottons are avoided as tests proved it produces poor naps. Low-twist yarn is used for filling; warp yarns have standard twist.

Grey goods are desized and treated to enhance their softness and absorption qualities. Reversing the movement of the goods through intermediate processes reduces the tendency to compact the yarn. In the napping process, speed of worker rolls is adjusted for desired type of nap. It has been found that the left-drive rolls should run faster than the right-drive rolls to produce an even nap.

Sheeting for napping has an 8–10% weight loss in bleaching and an additional loss of 5–7% during napping.—Textile World, D, 131

PRINTED CIRCUITS COMING

Unitized wiring for electronic devices is destined to be important. But technical problems still to be solved will prevent it from revolutionizing the field overnight. Six methods of achieving unitized wiring were discussed at a recent printed circuits symposium. They are: printing, spraying, dusting, stamping, chemical, and vacuum.—Electronics, D, 74

ELEVATOR-DUMPER—Free-flowing materials are lifted and poured into process equipment or bins by the new Cesco dumper, a miniature portable skip hoist. Capacity is 500-lb. of loose material or liquid, and the skip will make 100 trips per hr. The Colson Equipment & Supply Co. unit is made in 5-, 6-, 7-, and 9-ft. heights.—Chem Eng, D, 166

LEADING-EDGE JETS BOOST HELICOPTER LIFT

Wind-tunnel tests by Carlat Development Corp. of a model airfoil fitted with leading-edge, cold-air jets have proved it possible to obtain 50-200% increase lift above basic airfoil characteristics and at the same time induce a propulsive force. The jetting rotor gives a high factor of stability, permits takeoffs and landings at high angles of attack with loads sustainable at cruising speeds, and permits a "settling" approach.—Aviation Wk, D 15, 38

NEW CHEMICAL PRODUCTS

Many uses associated with surface phenomena are seen for the new microscopically fine, highly pure silica powder introduced by Linde Air Products Co. It forms stable suspension in water and in many organic liquids; stable or thixotropic gels, dilatant liquids, and other colloidal systems can be formed. Added to plastic materials, the powder gives greater strength, improved pigment dispersion. It is suggested for use as a catalyst carrier; paint, varnish, and lacquer ingredient; compounding and reinforcing agent in rubber and various other products.

Stiffness, hardness, and tear strength of both natural and synthetic rubbers are increased by a new latex developed by Goodyear Tire & Rubber Co. Light color and low specific gravity permit use of the Pliolite latex 190 where darker and heavier reinforcing agents cannot be used.

A new class of insecticides which are nonpoisonous to men and animals has been announced by Mellon Institute and Dodge & Olcott, Inc. The new synthetic materials include piperonyl cyclonene and related compounds. The former is a mixture of chemicals, most important being hexyl-5-(3, 4 methylenedioxyphenyl) - 3 - carbethoxyl - 2 - cyclohexen - 5 - one.

Synthetic methionine now is produced in commercial quantities by U. S. Industrial Chemicals, Inc. The amino acid has shown promising results in treatment of liver damage. Small additions to vegetable protein increase biological efficiency and allow replacement of marine or animal protein in short supply.—Chem Eng, D, 177, 180, 186

DRUM CARRIER—Attached to any fork-type power truck, a new device handles one to four drums at a time. Soft rubber shoes grip each drum firmly. A quick-detachable hydraulic valve permits removal of carrier from truck in 10 min. Pallet Engineering Co. introduced the unit.—Am Mach, D 18, 136

ONE-STORY WAREHOUSES

Longer and lower one-story warehouses are an industrial trend in the United States, mechanical handling of materials being facilitated by the single-story construction. Tests show that one-story warehouses allow most economical use of materials handling equipment—as much as 50% in time and space is saved. Material can be piled higher and movement of materials from floor to floor is eliminated.—Business Wk, D 13, 24

Paves ½ Mile of Road Per Day

Laying of 9-in. thick, 11-ft. concrete pavement is paced by two-drum pave to which all operations are geared. Integration of work avoids bottleneck

By careful integration of operations to avoid bottlenecks, S. J. Groves & Sons Co. laid one-half mile of 9-in. thick, 11-ft. concrete pavement per 10-hr. day on U. S. Highway 422. Operations were geared to the output of a 34-E dual-drum paver. Paving crew of 100 men was spread out along nearly 2 miles of highway. Working nearly a mile ahead of the paver was a motor grader with scarifier blade, and a 10-ton roller that maintained the previously compacted embankment. Between these units and the paver were the following crews, in sequence.

A two-man crew setting alignment and grade stakes; formgrader excavating trench for 9x9x¼-in. steel road forms; formsetters and two-man crew driving pins with compressed air; subgrader and light roller making the final cut and finish of subgrade; hydraulic crane excavating cross drains, together with a truck and wheel-barrow crew installing crushed stone in the drains; and two two-man crews installing expansion joints, transverse construction joints, and longitudinal beveled keyway forms between pavement lanes.

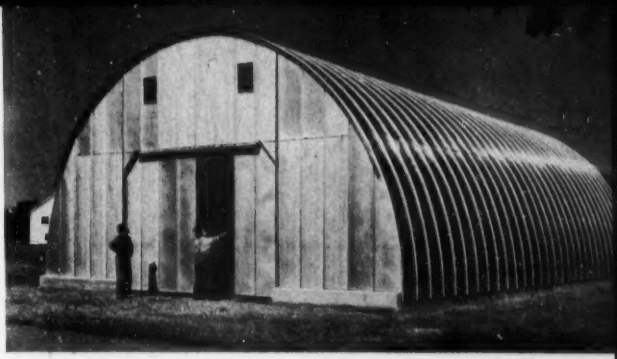
Immediately behind the paver was a concrete spreader; two concrete finishing machines; a longitudinal screed; two finishing crews—one handling long-handled hand screeds and burlap drag, the other removing expansion joint caps, edging, trowelling of joints, and making final burlap-drag finish.

This equipment operated within 20 ft. of paver, but behind it was a long stretch of paving being cured under waterproofed building paper. As the pavement took its final set, a truck-mounted hydraulic crane loaded road forms onto flat-body trucks for redistribution ahead of paver. Final operation was sealing joints and keyways, done by one man often more than a mile behind paver.

Concrete aggregates and cement were batched in a portable plant and trucked to paver in two-batch trucks. Maximum haul was 7 miles, for which 25 trucks were needed. Mixing water was hauled to the project in three 1,250-gal. truck-mounted tanks.

A typical 34E mix of the 3,600-psi. concrete included 827 lb. of cement; 1,493 lb. of sand, and 2,891 lb. of crushed limestone.—Cons Meth, D, 72

Ordinarily a back-breaking job, excavation of cross drains on highway project was done at rate of 850 lin. ft. a day with the new hydraulically operated Gradall on a 4-wheel drive truck. Same unit loaded steel road forms on truck, using a chain bridle with pipe spreader.



ALUMINUM BUILDING — Prefabricated buildings of arch-roof type are made of aluminum by Reynolds Metals Co. Standard size is 36x60 ft., but length can be varied by 6-ft. sections. Individual arch sections are easily raised into position after assembly, then are anchored to foundation, and sheathing sheets are attached. — Chem Eng, D, 158

BUTANE USED AS FUEL FOR PLANE IN FLIGHT

Butane, natural gas in a liquid state, was used recently to power a 2-place Cessna personal plane in flight. Standard aviation gasoline was used for the takeoff. Any conventional airplane engine can be converted to the use of butane, using a cut-off valve to switch from regular aviation gas to butane after takeoff. Great saving in fuel cost is realized, as aviation gasoline costs 37¢ per gal. while butane costs but 9¢ per gal.

Butane is passed near the engine's oil lines where it is vaporized, the vapor being taken through a standard carburetor and into combustion chamber. Butane is said to be easier on the engine, as it burns at an even rate. On standard aviation gasoline, the Cessna develops 2,600 rpm.; on butane, 2,500 rpm.—Aviation Wk, N 24, 25

CONTINUOUS KNIT BLEACH

Knit goods are bleached at great saving in time by means of a continuous peroxide process at Spring City Bleach & Dye Works, Inc. Hand, stretch, and whiteness are comparable to kier-bleached goods. Goods are processed without pretreatment through a one-stage range consisting of a washer, alkali-peroxide saturator, heater tube and J-box, and a washer. A single-leg tube preceded by a small J-box replaces the standard double heater tube, reducing undue tension on cloth. J-box temperature is 206°F.

Knit goods are produced at the rate of 160 yd. per min. J-box storage time is 1¼ hr. Total processing time is 1½ hr., against overnight by standard methods. —Textile World, D, 109

ALLOY STEEL SUPPLIES GOOD

Although carbon steel will remain in short supply in the U. S. in 1948, there will be no shortage in alloy steels. Reasons: increased melting capacity, increased tenfold since prewar; improved "know-how"; and large supplies of alloy scrap.

Specifically by alloys, supply and demand is:

Stainless Steel Bar—Demand not expected to increase; supply is plentiful; deliveries are normal.

Stainless Plates—Demand is increasing but supply is adequate. Delivery is normal.

Stainless Sheet and Strip—Demand is high with all capacity in production. Blacklogs are expected to drop.

Alloy Tool Steel—Demand has fallen off sharply since the war's end and has remained low. Supply can fill demand.

High-temperature Alloy Steel—Trend of demand is up but supply is sufficient to meet it.—Business Wk, D 13, 36

TECHNICAL SHORTS

Stops Chatter—To take the chatter out of a screw-thread miller (where there are several spindles on a large horizontal rotary table), each unit was mounted on springs instead of being bolted to the rotary table.—Am Mach, D 4, 104

Prefab Forms Cut Costs—Big savings in labor and time were made by shop fabrication of 400 M ft. of timber forms for several large concrete structures on Conemaugh Dam project. Design of substructures for six major bridges invited multiple use of fabricated forms. Each of hundreds of sections of forms was precision made of 2-in. facing lumber, with 2x6 and 2x8 ribs, in 80x40-ft. well-equipped carpenter shop.—Cons Meth, N, 93

Mine Pumps Put Underground—By installing deepwell pumps underground instead of on surface, Lake Superior Coal Co. cut installation costs in half. Equipment is placed over a shallow sump near hoisting shaft and discharges through a column line in the shaft. Two 2,300-gpm. turbine pumps are used. They service two seams, one above the other.—Coal Age, D, 98

Wattmeters Record Production — Recording wattmeters are connected to individual sheet polishing machines at Eastern Stainless Steel Corp. Number of cycles on the chart is the number of sheets produced. The wattage indicates polishing pressure and work quality. Charts help foremen control loading of machines and provide production control information.—Elec World, N 22, 93

Cleans Plane Oil Coolers—Airplane engine oil cleaners are cleaned at the rate of two per hour with a new cleaning method developed at the USAAF Fairfield-Suisan air base. Water, creosote, oil, soap, and trichlorethylene are heated to 160-185°F. Cooler is placed on a rack and the solution is forced by compressed air through baffles. Then soap and water and finally a hot water rinse follow. Cleaning time is reduced 75%.—Air Trans, D, 45

Rubber Grooves Concrete — Decorative grooves on concrete surface of pier for bridge across Chesapeake & Delaware Ship Canal were formed by rubber strips glued to forms. Strips are removed easily without chipping mortar and can be re-used many times.—Cons Meth, N, 104

SPEEDS PAVING—To permit pouring concrete road slab full depth in one pass, the speeding paver advance, reinforcing mesh hung from steel pipes spanning pour. Steel fingers welded below extra heavy 2-in. pipe support mesh at correct elevation for specified 2-in. embedment, yet are unhooked easily after concrete is dumped when pipe is turned by end handles. Andrew West Co., Inc., introduced the technique.—Cons Meth, D, 99

All-welded Piping System—All joints of pipe in the 7-story Cleveland Clinic are welded as are brackets and hanger frames. Tapered sections are made by flame-cutting pipe longitudinally, then notching it and bending the pipe. To fabricate hanger frames, ends are scarfed then joined at corners with inside and outside welds. "Plumber's sleeves" are welded to bracket.—Weld Eng, D, 51

Hanging Columns—To provide a column-free first floor in a new store, two hanger columns were suspended from roof trusses to carry the second and third floors. Assembled the first floor with second and third floor beams connected to them, the hanger columns were hoisted into position for hanging from the trusses.—Cons Meth, D, 76

Exhaust Cools Engine—Exhaust pipes on each engine on the new twin-rotor helicopter of Kellett Aircraft Corp. are placed in stainless steel venturi-shaped ducts. The air flow induced by the exhaust cools the engine without the use of fans, saving power.—Prod Eng, D, 88

Porcelain Wall Covering—Porcelain enamel wall covering for bathrooms and kitchens is being made with 32-gage strip steel 16 in. wide. Material can be cut with shears and fastened to walls with stainless steel molding or paste.—Am Mach, D 4, 85

Infrared Drys Blankets—Elite Laundry Co. has dried 10,000 blankets in past year by 108 150-watt infrared lamps mounted on two facing panels 3½ ft. apart. Drying two blankets requires 4 min., 2 kwh. Moist air is removed from dryer. Blankets do not shrink, are fluffier than those dried by standard methods.—Elec World, D 6, 124

Traveling Chute—Mounted on a rolling gantry frame, an inclined chute carrying three elephant-trunk spouts distributed concrete for the 6-in. floor slab of a large grease plant and warehouse. Scoopmobiles with ¾-yd. dump buckets raised concrete 12 ft. to upper end of chute.—Cons Meth, D, 82

Ammonia Liquor Fertilizer—Farmers around Verdun, Germany, have found an effective fertilizer in the ammonia liquor given to them by a local gas company. Quantities of sulphuric acid normally used to convert the liquor into commercial fertilizer are saved.—Chem Eng, D, 131

Wholesale Meat Club — A Philadelphia butcher has formed a meat club—dues $1.25 a week. Dues permit the 800 members to buy meat at wholesale prices, with no limit on amount purchased. This saves members 25%, or one week's meat per month. It also guarantees the butcher an income of $1,000 per week.—Business Wk, D 13, 20

Handy Hotel Lights—In a large new hotel, all lights in each room will be conveniently controlled from a bedside panel. This emphasizes what has become almost a blind spot in wiring system design—adequate and handy switching.—Elec C & M, D, 39

Spot to Butt Welding—By attaching an air-clamping fixture to two portable welding guns, Progressive Welder Co. devised a stationary butt welder for assembly of double-end wrenches. Production now reaches 150 wrenches per hr., two operators being used.—Weld Eng, D, 63

Saves Fingers—Operator's fingers automatically are pushed away when plunger of riveting machine comes down by safety device developed at Emerson Radio & Phonograph Corp. The sweep operates in conjunction with the foot pedal.—Am Mach, D 4, 129

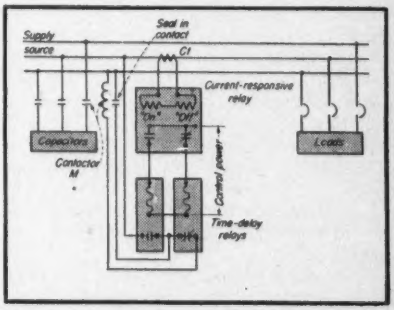
Saves Hand Tamping—To eliminate expensive compaction of earthwork by hand tools alongside walls, U. S. Bureau of Reclamation engineers developed a special sheepsfoot roller with straight drum ends without side-frames. A 5-ft. wide roller was cut in half, and a 5-in. chrome steel axle installed and fastened to a 12-ft. box tongue between drums.—Cons Meth, N, 103

Electrodeposited Tungsten — Smooth, thick deposits of tungsten alloyed with cobalt, nickel, or iron are obtained from electrolysis in hot ammoniacal solution containing an organic acid, according to the National Bureau of Standards. Properties somewhat resemble those of Stellite. It is easily deposited on irregular surfaces. The alloy retains its hardness at high temperatures.—Eng & Min J, D, 95

Acid-proof Floors—When joined by acid- and alkali-proof cement, hard-burned shale or fire clay brick and tile food plant floors have held up more than a decade without maintenance. There are two types of satisfactory cement—sulphur cement and synthetic resins. —Food Ind, D, 120

For Night Parking Lots—With the new ticket dispensing meters, 17 Milwaukee, Wis., parking lots no longer need to close during night hours. Patron deposits 25¢ in meter and receives a ticket which is placed under windshield wiper.—Science Ill, D, 77

Fireproof Insulation—New fiber glass insulation for aircraft will not act as a wick or burn, according to CAA. A vinyl resin blanket covers the bulk fiber, and over this is placed another covering of glass and vinyl fabric. —Am Mach, D 18, 83



CAPACITOR SWITCHING—Use of control equipment for automatically switching capacitors has increased rapidly in the past few years. In factories, the capacitors are switched to reduce voltage and losses; to meet requirements of a rate clause; or to comply with utility recommendations. Switching devices are either contactors or air circuit breakers. Master control elements are voltage, current, kilovars, time switch, and motor-starter. A single-step current control is diagrammed above.—Elec. World, N 22, 88

Revolution in Horticulture

Application of hormones changes pattern of plant growth. Technique has many important practical applications, including weed killing

For the first time, man can change the pattern of growth and development of plants. And growth-controlling hormones and other chemicals now in use are but crude beginnings of a chemical revolution which is sweeping through the agricultural world.

Rooting of Cuttings—Indolebutyric and naphthaleneacetic acids, or their sodium and potassium salts, are the hormones most successful in stimulating root development. Treatment of stem cuttings consists of dipping the basal ends in hormone preparations. Earlier rooting and sturdy root systems are produced in many species of deciduous flowering shrubs and broadleaf evergreens. Percentage of rootings in difficult-to-root cuttings is increased.

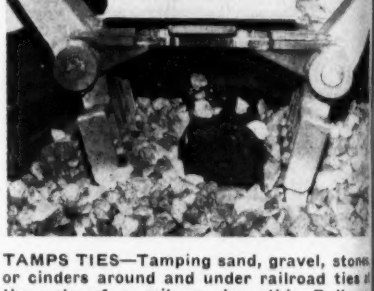
Blossom Thinning — Laborious and costly hand thinning of heavy apple crops may be eliminated by chemical sprays which reduce fruit set. Treatment permits control over biennial bearing and gives larger fruit, better color in red varieties, and better pest control. Dinitro compounds and creosote oil are the preparations most used. But naphthaleneacetic acid, naphthaleneacetamide, and the sodium salt of naphthaleneacetic acid in low concentrations recently have proved effective.

Control of Fruit Drop—Large losses often are caused by the dropping of certain apple varieties before the crop is ready for picking. Hormone treatments hold the fruit on several days longer by delaying the separation of the abscission layer. Treatments for several fruits other than apples are in the experimental stage. Holly and a few other evergreens can be treated to delay the falling of leaves and berries for 10-14 days.

Most of the commercial hormone preparations for controlling apple drop contain the potassium salt of naphthaleneacetic acid. The spray applied contains 0.001% of the hormone. Dusts are easier and less expensive to apply and are as effective as sprays. These contain 0.1% of naphthaleneacetic acid or naphthaleneacetamide.

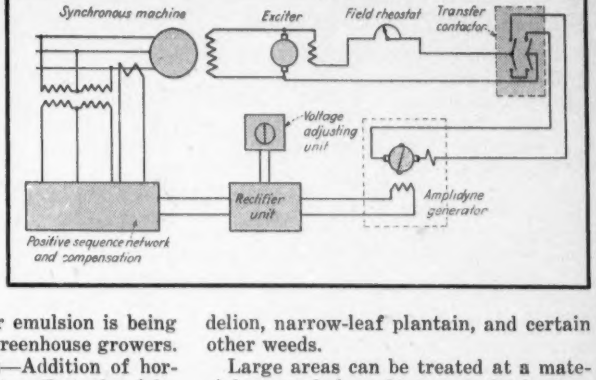
Fruit Set—Seedless Fruits—Only with the tomato plant have hormones been used successfully and profitably to date in increasing fruit set. Some fruits thus produced are seedless. The treatment also increases fruit size. Several other plants have been made to produce seedless fruits by hormone treatment, including squash, eggplant, pumpkin, and strawberry.

To increase fruit set, hormones are applied to the flowers in pastes, sprays, emulsions, or aerosols. A mixture of indolebutyric acid and naphthoxyacetic



TAMPS TIES—Tamping sand, gravel, stone or cinders around and under railroad ties at the rate of a mile a day, this Pullman-Standard Mfg. Co. power track-ballaster does ten times the work of 50 men in a day. The 5,250-lb. crosshead bar spans the length of the tie; it has 32 tamping shoes. The shoes squeeze ballast under ties, straightening them. It is operated by a crew of five.—Business Wk, D 20, 45

CONTROLS CONDENSER—An Amplidyne voltage regulator on a 60,000-kva. synchronous condenser has proved satisfactory in speed of response, simplicity, and freedom of excessive maintenance. More installations are planned by Southern California Edison Co. Small rheostats and control networks are permitted. Unit regulates field excitation.—Elec World, D 20, 68



acid in water spray or emulsion is being increasingly used by greenhouse growers.

Treatment of Seeds—Addition of hormones to fungicides to offset the deleterious effects of the latter on germination and growth is reported to give promising results. Germination and subsequent growth and yield are helped, for a few kinds of seeds.

Other Uses—Hastening or retarding time of flowering to extend picking and marketing season is one of the promising uses of synthetic hormones in horticultural practice. Preliminary work has demonstrated the feasibility of the practice in strawberry and bean culture, and it has proved that pineapple plants may be brought to fruit 2–6 months in advance of normal.

Weed Control—Certain synthetic plant hormones give promise of revolutionizing chemical weed control. Some of the phenoxyacetic acids—notably 2, 4-D—seem especially efficacious. They are effective at the rate of 1 to 2 lb. per acre when applied in an aqueous or oil spray, or at somewhat higher rates when used in a dust carrier.

In general, broad-leaved plants are relatively susceptible to hormone weed killers, whereas cereals and other grasses are relatively resistant. This selectivity adapts the substances particularly well to use on such crops as oats, wheat, rice, and sugar cane, as well as on bluegrass or mixed-grass lawns infested with dandelion, narrow-leaf plantain, and certain other weeds.

Large areas can be treated at a materials cost of about $1 an acre for herbaceous plants, somewhat more for woody plants. Killing weeds in the soil is a promising new development still in the experimental stage.

Breaking Dormancy—Chemical treatment of freshly harvested potato tubers shortens their period of dormancy; a procedure useful where the growing season is long enough for a second or late crop.

New Varieties—Chemical production of new varieties has become a horticultural practice. By doubling chromosomes, it often is possible to produce polyploid plants more desirable in size, vigor, or other characteristics. Colchicine has proved the most useful chemical.—*From "Hormones and Horticulture," McGraw-Hill Book Co.*

HARDENS STEEL BETTER

A concentration of as low as 2.5% caustic soda in water is used by Ford Motor Corp. to quench steel, and it dissipates heat from the steel about twice as fast as water. Cheap carbon steel is as hard after caustic quenching as alloy steel after oil quench. Scale patches, causing soft spots, are more easily loosened by caustic than by water. Less vapor is formed, hence another cause of soft spots is minimized.—Business Wk, D 13, 64

BLOWER DOORS PERMIT SHORT JET TAKEOFFS, LANDINGS

The Grumman-built, carrier-based, Navy jet-fighter XF9F-2 takes off in 450 ft. and lands at 80-85 mph. Short takeoffs are accomplished through use of blower doors, forcing air through the engine plenum chamber to provide high-energy air flow at comparatively low airplane speeds. Doors, two under keel behind cockpit and two more lower and to the rear, are opened for takeoff. Added air permits engine to develop maximum static thrust when it is most needed—at takeoff. Doors are also opened during landing approach and preserve the flow through air intakes.

Also important in the low landing speed are the wing nose flaps, creating high camber and producing a low stalling speed through a lift coefficient much higher than that of other jet planes.

Engine is a Rolls Royce Nene turbojet developing 5,000-lb. static thrust—5,750-lb. with water injection. Pratt & Whitney engineers plan to modify the engine to include water injection and tailpipe after-burning.—Aviation Wk, D 15, 12

BRIDGE GIRDER PULLED INTO PLACE BY WINCH

Steel girder for deck of multi-span highway bridge in Georgia was pulled into place by a hand winch, eliminating the necessity for floating equipment or elaborate falsework. Crossing had a total length of 810 ft.—the main channel crossing consisting of two 80-ft. and two 100-ft. spans and the remainder simple 30- to 50-ft. lengths. Piers in the main channel were high and rested in deep, swift water.

Before the four-span unit was pulled into place, three timber falsework bents were built between the approach piers of the north end of the crossing. An all-welded, tapered launcing nose was welded to the forward end of the first section and was attached to winch by a four-part block and tackle. Girder rolled on 6½-in. dia. hollow-steel rollers. Winch was placed above girder level to reduce pulling force.

After girder was across full span, the launching nose was cut free and rollers were removed. Crew of five did the entire girder job.—Eng News-Rec, N 27, 68

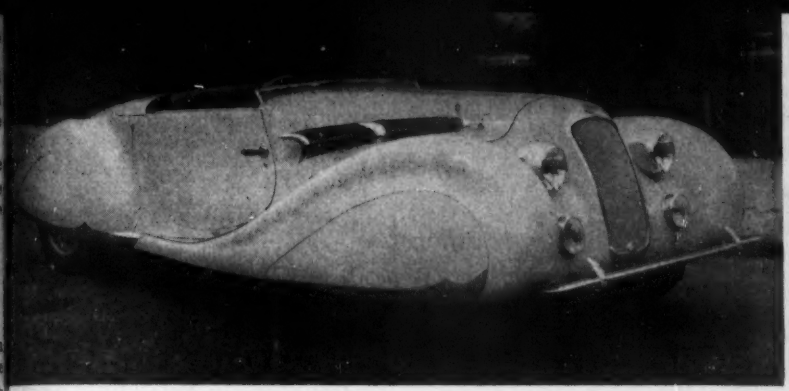
DESIGNERS SHOULD TEST FULL-SIZE PARTS

Testing of conventional notch bars of metal does not serve the purpose of the designer, although there is an all-too-prevalent idea that it does. The only way the designer can be certain how his actual structure will respond to service conditions of stress concentration and restraint is to take the most severely stressed part of his structure, in full size, with its actual notch or stress-concentrating condition, made from the lot of steel he plans to use, and test that. He will carry the tests well below the lowest operating temperature to be met.

Very disastrous failures have occurred when reliance was placed on steel meeting the foot-pound specification in the tiny notched bar, when the structure itself had far more restraint against deformation and therefore went over the borderline between toughness and brittleness. This caused welded ship failures, the plates cracking in brittle fashion with the fracture progressing at a rate of the order of a mile a second.

Another factor, too often neglected, is the stress produced by differential thermal expansion. This is best determined by strain gage-measurements on critical parts of actual structures under operating temperature conditions.

There is great need of facilities for low-temperature testing and examination of full-size large parts. The majority of cases could be handled in cold rooms such as used by automobile and aircraft manufacturers for testing low-temperature performance.—Prod Eng D, 81

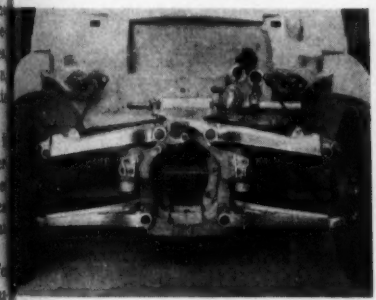


NE FRENCH coachwork is exemplified by Delage car. Many unusual cars were shown.

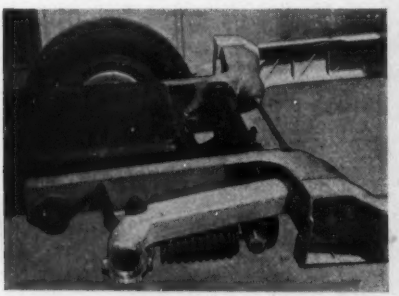
ROM ITALY comes this Volpe. Car is 8 ft. ng, 3 ft. wide. Engine is in the rear. It es 100 km. on 3 liters of fuel.

Auto Progress Seen at Paris

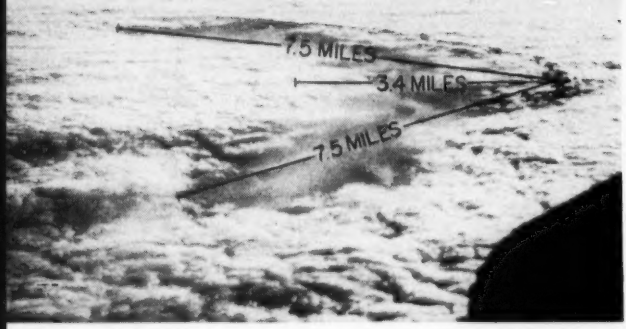
Weight reduction was featured in cars shown at the recent Paris Automobile Salon. Trend is away from front engine, with application of power at rear. Future cars will have both engine and power application either at front or rear.— Am Auto, D, 17



RONT SUSPENSION of the Gregoire, rench car shown. The company, in con- nction with Aluminum Francaise, has pro- ced a flat four of 122 cu. in. displacement. ar is of light alloy except for crankshaft, earings, cylinder liners, and springs. It rries five passengers.



REAR SUSPENSION of the Gregoire. Wheelbase of the car is 98 in.; tread is 55 in. Complete, it weighs 2,090 lb, and maximum speed is 85 mph. Chassis is made from five main castings, forward one including windshield frame and door posts and weighing 99 lb. Elements are bolted together.



MAKES HOLES (CLOUDS — By dr ping dry ice pell into heavy cloud airplane pilots make holes in clouds and land wi out danger of icing wings. Hole shown 15 miles long and miles wide. It formed in 15 min. Science III, Ja, 49

RECENT ADVANCES IN FERMENTATION

Continuous cooking and pressure mashing of grain are important recent advances in industrial fermentation processes. Grain now is mashed in closed vessels at about 65 psi. with direct steam. Two types of continuous cookers are operating. One is a high-temperature, short-time pipeline cooker. Grain, water, and stillage are slurried together and mixed with 350-360°F. steam while passing through a special heating jet. The hot slurry passes to the pipeline cooker designed for 1-2 min. holding time. Cooked slurry is flashed to a vacuum cooler, then mixed with the malt slurry, where conversion occurs almost instantly, and the hydrolyzed mash is discharged to the cooler. Total retention time is about 6 min. Advantages are lower equipment, operating, and labor costs; better control and steam recovery. A similar cooker can be used for hydrolysis.

A continuous cooker embodying low temperature and long holding time consists of a vertical tower. Heated slurry of grain and malt is pumped in at the top, and completely hydrolyzed mash is continuously withdrawn from the bottom. The system has the advantage of using low-pressure steam.

A continuous fermentation process has operated successfully on a small noncommercial scale. Sterile mash is added continuously to a fermenter which has capacity sufficient to allow 8-hr. retention. Fermented mash is withdrawn continuously to a beer well with 2-hr. retention, then fed directly to the distillat process.

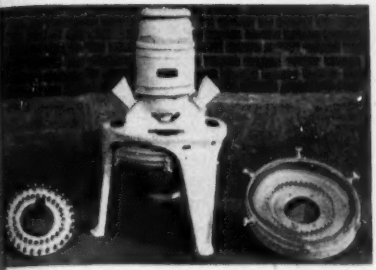
Development of yeast cultures has b done continuously on pilot-plant sc The process involves growing yeast sterile broth aerated with sterile After about 4 hr. of active growth, yeast wort is removed continuously centrifuged to increase yeast-cell c centration. The supernatant fluid, c taining some alcohol, is sent to the tillery and the yeast transferred to frigerated storage. Sterile wort is ad continuously to the fermenting vessel finished yeast continuously withdrawn this short, 5-hr., process.

Shortage of barley malt led to the velopment of mold enzymes for hydrol ing grain starches to sugar. Use of m as a malt adjunct is thought to be q promising.

Citric acid has been produced by aer mold fermentation.—Chem Eng, D,

QUICK BATTERY CHARGE

Fast chargers, primarily designed 6-volt batteries, now are used succ fully to charge 12-volt truck and batteries. Only half of the cells ca charged at one time. After the first t cells are charged. the battery should



MPACT MILLING—Previously used for destroying insect infestation in cereal products, he Entoleter centrifugal impact machine has een employed to mill flour experimentally. Prospective advantages are improved sanitaion, less expense for milling equipment, lower ower consumption, and economy in maintenance. The principle may have wide applitation in grinding and reduction. As product passes through machine, it is finely roken up by combined action of impactors n rotor and stator. When two machines ere used in series, they duplicated a break oll in reduction produced.—Food Ind, D, 90

ermitted to cool before charging of the hree remaining cells begins. A 30-min. harge will not fully charge batteries ith a capacity greater than 80 amp.-hr., ut a 45-min. charge will overcharge an 0-100 amp.-hr. unit.—Bus Trans, D, 56

PTICAL COMPARATOR INDS TOOL ERRORS

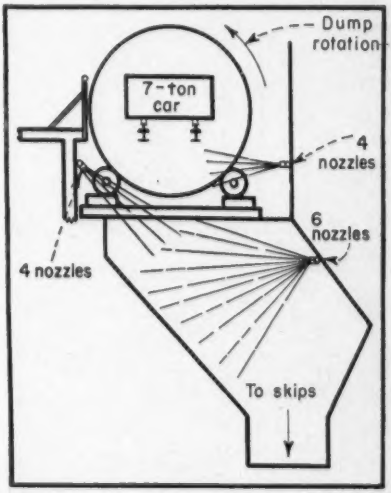
xperience at Lockheed demonstrates at much waste can be saved in the manfacture of interchangeable precision arts if the tools are first checked against tart gages by the optical comparator ethod. The technique may be applied here it is possible to machine a "sec-on" of the work along with a trial lot, that a profile of the cut is obtained.

With splined members, flat washers ere locked against the end of the shaft nd hobbed at the same time. Broach mples were made by holding several ashers together and drawing the broach rough. These "sections" of the workpiece accurately reproduced the action of the tools and were of convenient size for easy projection on the comparator.—Am Mach, D 18, 87

SYNTHETIC CRYSTALS

Artifically cultured piezoelectric crystals will replace about 90% of the natural quartz in the Bell Telephone system in a few years. The ethylene diamine tartrate crystals weigh about 1 lb., are 6 in. long, 2 x 3 in. in cross section. They are cut into plates and gold coated.

Seeds of crystals are grown by evaporation of a saturated solution of the chemical, then constantly and slowly washed by a supersaturated solution for 3 months.—Electroncis, N, 144



SPRAYS TRAP DUST—Fourteen high-pressure, flat and solid-cone type sprays are used to trap dust as coal is transferred from 7-ton mine cars to 7-ton skips at Old Ben Coal Corp.'s underground rotary-dump station. Compound M a synthetic wetting agent—is added to the water in a 1:1,000 ratio. With only one-fourth the normal amount of water, dust can be reduced to the safe limit of 50 million particles per cu. ft.—Coal Age, D, 86

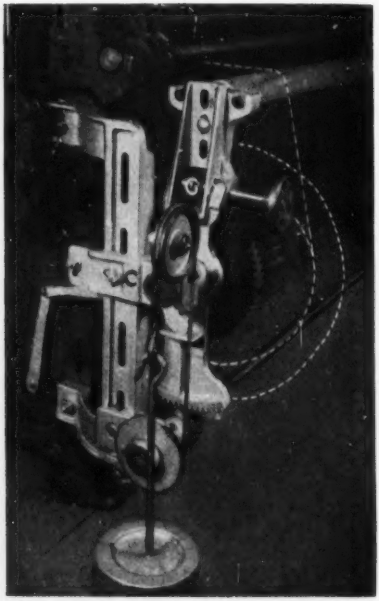
NEW DEVELOPMENTS IN ELECTRONIC ART

Cancer and other life processes can be studied more fully with stable isotopes than radioactive ones. A new mass spectrometer will reproduce measurements of the ratio of carbon 13 to carbon 12 within 0.25%.

Oscillographs of three simultaneous phenomena having frequency components as high as 10,000 megacycles can be made. The single sweep used is fast enough to resolve time intervals of 10^{-10} second. Magnetic focusing is used wit electrostatic deflection in each of th three independent electron guns. Sma plates reduce deflection sensitivity, beam is focused on photographic film a 0.01-mm. spot and trace is enlarg 100×.

Gas can be analyzed by passing it ove one of a pair of tungsten filaments in bridge. Cooling effect of gas, and there fore the resistance of the filament, de pends upon composition of the gas.

Microwave therapy promises to be mor useful than short-wave diathermy. Th waves readily can be directed for loca heating, they are absorbed 7,000 time more effectively by water at 100°F. tha the 27-mc. waves, and there is no radi interference.—Electronics, D, 198



OSCILLATING LET-OFF — Reported to maintain constant warp tension, relieve tension white shed is open, and let off warp at an even rate, this oscillating warp let-off motion has been developed by Textomatics, Ltd., England. Beam and whip roll oscillate around beam axis with the opening and closing of the warp shed. A rod operates a worm and worm wheel which turns beam.—Textile World, D, 166

ATOMIC STORAGE BATTERY?

As one way of putting to work the energ of nuclear fission, an atomic storage bat tery has been suggested by Atomic En ergy Commissioner Lewis Straus. Th idea is to put to work the radioactivity of materials which have been exposed t an atomic pile. If a quantity of such ma terials were enclosed in a box, the thinking goes, the box would get hot and re main so for a long time. This heat could be used to drive an engine. Tiny pinches of radioactive material have energy outputs as high as a fiftieth of a watt.—Elec World, D 6, 73

FLASH DRYING

Moisture in sewage sludge, food product waste, spent grain, or chemical proces waste can be removed by a flash-drying process developed by Combustion Engineering Co., Inc. Moisture-laden ma terial is exposed to air heated to 1300°F. under high velocity and turbulence. Ma terials needing disintegration are expose to air in an agitator. New method i cheaper, more flexible, and takes les space than standard methods.—Business Wk, N 1, 60

NEW WORLDS TO CONQUER IN COMMUNICATIONS

Modulation is not just a means of superimposing a message onto a readily transmitted carrier. It is also a means of protecting the message from noise during transmission.

Current basic investigations show that the ratio of received message power to thermal noise power is related to bandwidth. The greater the signal power, the narrower the bandwidth required in order to maintain a given quality of transmission.

The basic communications problem is to find modulation methods that make the theoretical improvements possible. The opportunity is open to conquer new worlds in communications technology.

Each time the bandwith of a frequency-modulated station is doubled, 6 db. is added to the signal-noise ratio. Pulse-code modulation improvement, however, is multiplicative, rather than additive. If 10 db. is added by doubling bandwidth once, then 100 db. is added by doubling it again—a vast improvement. Pcm equipment, however, is relatively expensive.—Electronics, Ja, 72

ALUMINUM REPLACES STEEL

There are 87 automobile parts which might be made of aluminum to save steel. At Ford 43 are in production or are regarded as possible. Among them are oil-bath air cleaners, running boards, and headlamp housings. Gasoline tanks and rear deck doors are possibilities.

By pound-for-pound replacement, an aluminum part can be made as stiff as a steel piece.—Am Mach, D 18, 96

TESTS CONTINUOUS DYEING

Problems arising from continuous dyeing in liquid media at elevated temperatures are solved by a simply constructed, easily operated laboratory dyeing unit. It is built in the form of a pad box fitting into a padder, the padder pulling the cloth through the unit at any desired speed.

The Monel metal unit is made in two sections, each an equilateral triangle. The inner section holds heated water to keep dye temperature at proper level. Passage between the two sections can be varied and is filled with developing bath or treating liquid. With a 25/32-in. space between sections and a 12-sec. immersion time, a 4-in. wide piece of cloth runs through unit with conditions equivalent to those in a plant-sized machine.—Textile World, D, 116

LADDER-ELEVATOR—New in materials handling, the Lad-E-Vator consists of two 12-25-ft. extensible ladder-like aluminum tracks up and down which travels a hoist-operated load-carrying platform on rollers. The tracks curve at the upper end to deliver the load inside a working area. Hoist is powered by engine or motor, handles 500-lb. load at 80 fpm., can be assembled and taken down quickly. Campbell Equipment Co., developed the device.—Cons Meth, D, 114

NEW PRODUCTS

Cool Grinding—Coolant is introduced at point of contact between grinding wheel and work by the new Cool Grinding method of The DoAll Co. The Coolant is fed at rate of 1 to 4 drops per sec. into special wheel adapter. It enters arbor hole of wheel at inside and is thrown to outside grinding face by centrifugal force. Splash guards, settling tanks, pump motors, and similar equipment are eliminated. Temperatures are several hundred degrees lower than in conventional wet grinding.—Am Mach, D 18, 168

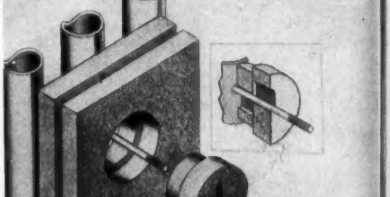
For Safe Landings—Airport runways are outlined under all visibility conditions by a new Westinghouse Electric Corp. lamp. A barrel-shaped housing has sealed-beam lamps at each end which give 1,000 to 100,000 candlepower. Atop housing is a 16 to 1,600 cp. lamp with asymmetric lens. Undirectional light of high-power lamps prevents lighted haze or fog curtains behind lamp. Bi-directional low-intensity light identifies runway during normal visibility.—Elec World, N 22, 120

Alarm Watch—Sounding much like the chirping of crickets, a Swiss-made wrist watch has an alarm to wake wearer or warn him of appointments. Two years of research on an alarm went into the watch without success before scientists tried emulating the cricket. It is a development of Vulcain Watch Co.—Science Ill, Ja, 75

Heat Transfer Plates—Heating tanks with a completely flat interior surface can be made by using Platecoils instead of tubular coils. Developed by Kold-Hold Mfg. Co., these are flat on one side, channeled on the other for circulation of the heating agent. The plates can be formed and welded as part of tank bottom.—Prod Eng, D, 176

Nylon Filters—Filter cloths made of nylon fabric have been developed by Filter Media Corp. Substantially inert to most alkalies and organic compounds and acids, the cloth is degraded by oxidizing agents and mineral acids.—Eng & Min J, D, 96

Multi-head Spot Welder—Utilizing 16 hydraulic cylinders and 8 welding transformers, a new multiple-head spot welder will weld 88 spots per min. and handle up to 11-gage steel. The Sciky Bros. machine is divided into 11 units, each a complete welder. —Weld Eng, D, 92



EASY-ON REFRACTORY — Two rotatable pieces of refractory material with elongated slots adjust the stud bolt to the new refractory tile of Geo. P. Reintjes Co., eliminating field drilling or cutting. Attached to the stud but spaced from the refractory by metal sleeves is a combination tile-anchor and insulation-holding nut.—Power, D, 130

Measures Wrinkle-resistance — Wrinkle-resistance of fabrics can be measured by a new device developed by Monsanto Chemical Co. One end of a creased fabric is inserted in a jaw. The other end hangs free, and is brought into alignment with the vertical line on the meter. The degree to which free end recovers is measured by the meter.—Textile World, D, 156

Phosphorescent Sheeting — Phosphorescent acrylic resin sheeting containing pigments that cause it to glow for 12 hr. after exposure to ordinary light has been announced by E. I. duPont de Nemours & Co., Inc. It can be used either indoors or out. It is adaptable to direction signs or clock faces.—Eng News-Rec, D 11, 144

Protects Aluminum—Used to keep aluminum quiescent in presence of corrosive agents, Alodine forms by chemical action a thin, tough, flexible skin that is positively integrated with the metal. It is applied by dipping or spraying. American Chemical Paint Co. developed it.—Prod Eng, D, 204

High-speed Relays — Hermetically sealed Mercury-contact relays have been developed by Western Electric Co. for application to all types of high-speed switching devices where accurate time characteristics are desired. Life expectancy is 10^9 operations; current and voltage capacities are large.—Prod Eng, D, 169

New Photographic Paper—A new silver-sensitized paper for reproducing engineering drawings on blueprint or direct process paper prints positive copy directly from positive original. It can be used in normal room light, giving high contrast. Worn, discolored, or opaque drawings can be reproduced on the Kodagraph "Autoposition" paper without redrawing.—Weld Eng, N, 94

Magnet Holds Castings—Using the new Hold-Tite electromagnet to hold heavy castings under a swing grinder is said to reduce overall grinding time 25%. Introduced by Dings Magnetic Separator Co., the device is available on a tilting trunnion with seven positions controlled by foot lever.—Am Mach, D 4, 144

Electronic Motor Control—Consisting of a high-gain balanced dc. electronic amplifier and a motor amplidyne, a unit developed by General Electric Co. provides regulated adjustable-voltage power supply for 20-to-1 speed control of dc. motors up to 1½ hp. It is useful as a regulated exciter for adjustable-voltage drives up to 200 hp. It connects to a 220- or 440-volt, 3-phase, 60-cycle power supply.—Elec World, N 22, 120

Tungsten-carbide Diamond Drill — Diamonds are placed in a tungsten carbide matrix in the new J. K. Smit & Sons drill bit. Wear, breakage, and loss of diamonds is reduced.—Eng & Min J, D, 94

Drills Concrete—Rotary pulverizing action is utilized to drill holes through masonry with the new drill introduced by Concrete Termite Sales Co. It is made in sizes from ½ to 1⅛ in. dia.—Power, D, 170

Gas Detector—Inflammable gases or vapors are analyzed in terms of lower explosive limit by one range of the new Vapotester of Davis Emergency Equipment Co., Inc. A second scale indicates gases in their toxic range. Basic principle is increase in resistance of a filament when exposed to gas or vapor-air mixture.—Elec World, N 22, 126

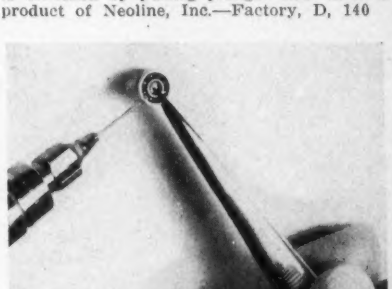
Carbide Calculator—Speed, feed, and horsepower for carbide milling operations are computed by a pocket sliderule calculator developed by Super Tool Co.—Prod Eng, D, 172

New Transit Bus—Employing war-developed construction techniques and materials, the new Reo Motors, Inc., transit bus is of monoque construction. Alloy aluminum is used for weight saving; strategic points are reinforced with high-tensile, rust-resistant steel. The 427-cu.-in.-displacement engine is so mounted that offset differentials, angle drives, and transfer cases are eliminated. A 2-door model seats 37, the 1-door model, 40. —Bus Trans, D, 175

Checks Textile Roll Temperature — Roll surface temperature is controlled and recorded by a new measuring head mounting against the roll. A miniature resistance bulb is most accurate below 600°F. Unit is mounted on Marinite to isolate it from ambient temperature effects. It is a development of Foxboro Co.—Textile World, D, 156

Casting Resin—To simplify work on small electrical parts, Mathieson Alkali Works, Inc., has developed a casting resin made from dichlorostyrene. Resin is poured over electrical parts; when set it forms a good insulation and is water resistant.—Business Wk, D 13, 66

Locking Plug—Fitting any standard outlet, a new neoprene light plug locks into position by pressing a plunger atop plug which spreads prongs to give positive contact. It is unlocked by pulling plunger out. It is a product of Neoline, Inc.—Factory, D, 140



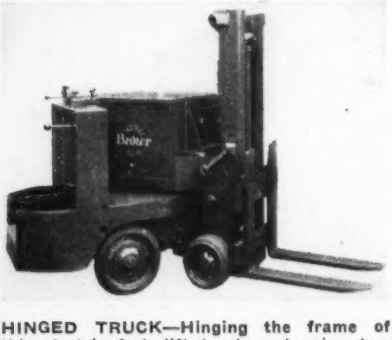
SMALLEST BALL BEARING—Intended for electrical, electronic, geophysical, and similar applications requiring freedom from magnetic influences, this is the smallest fully ground non-magnetic ball bearing ever made. Beryllium copper is used; standard dimensions are ¼-in. O. D.; 5/64-in. bore; 3/32-in. width. New Hampshire Ball Bearings, Inc., makes it.—Am Mach, D 18, 143

NEW PRODUCTS

Simple Truck Bodies—Heavy-gage aluminum for sides and top of the package-delivery bodies built by Hahn Motors, Inc., make unnecessary the ribs or stiffeners associated with sheet-steel construction. Yet weight is less for a given strength.—Am Mach, D 18, 97

Fluid-drive Elevator—For industrial and commercial use, a new fluid-drive elevator is powered by a single-speed ac. motor. This arrangement gives smooth start and stop, low power demand, and accurate leveling. Motor starts without load, power being transmitted directly to coupling. Cable sheaves start slowly. When power is shut off, coupling gradually slows sheave until brake is applied. Two-way leveling is automatic. It is a development of Warsaw Elevator Co.—Business Wk, N 8, 76

Variable-speed Motors—Stepless speed adjustment over a 3:1 is attained by turning a dial on the new Tri-clad brush-shifting induction motor of General Electric Co. The motor is available in ratings from 3 to 50 hp., 220, 440, and 550 volts.—Prod Eng, D, 176



HINGED TRUCK—Hinging the frame of this electric fork lift truck and using two nonsteering axles permit operation in narrower warehouse aisles. The 54-in. long truck is steered hydraulically by lever control, and forks can be lifted or tilted by similar controls. Frame of the Baker-Raulang Co. truck is a welded and riveted assembly of plates and shaped members. Suspension for power axle unit has ball-and-socket mounted driving-torque and axle-thrust yokes to permit frame sills to remain level while wheels pass over pavement irregularities.—Prod Eng, D, 92

Metal Packing—Self-forming, self-lubricating packing of antifriction alloy metal has been developed by Flexrock Co. It molds itself to shape of stuffing box to effect seal, yet permits action of rod or piston.—Power, D, 16

Electronic Timer—Independently variable on and off intervals ranging from 0.1 to 4.0 min. are provided by the repeat-cycle timer developed by G. C. Wilson & Co. Relay contacts carry 10 amp. at 115 volts ac.; timers for 115-volt dc. can be provided. Timer can be synchronized with other equipment.—Am Mach, D 4, 156

Long-life Magnets—New Alnico permanent magnet holding assemblies are vacuum impregnated to prevent moisture penetration and internal rusting. Cadmium plating prevents external corrosion. Stray magnetic fields do not affect these assemblies introduced by General Electric Co. They hold magnetism indefinitely.—Power, D 134

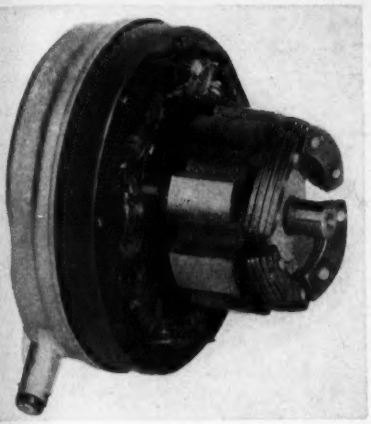
Brewer's Yeast for Bread—Successful development of a dried brewer's yeast suitable for incorporation in bread to increase nutritional value has been announced by Brewers Yeast Council. As a result of special treatment before drying, the yeast does not impair loaf volume and crumb texture.—Food Ind, D, 118

Small Hydraulic Transmission—Stepless speed adjustment from zero to maximum rpm. in either direction of rotation is provided by the ½-hp. hydraulic transmission developed by Vickers, Inc.—Am Mach, D 4, 156

Advance in Transformers—By using preferred-orientation electrical-core steel, weight savings of 17-46% are achieved in new distribution transformers of Allis-Chalmers Mfg. Co. Other features include spray-bonderized steel tanks with machine-welded seams, high-voltage pockets fabricated from a single piece, and low-voltage bushings with gasketed joint held in compression by a steel ring.—Power, D, 164

Concrete Vibrator—With no engine and no flexible shaft, Maginniss Power Tool Co.'s concrete vibrator is operated by one man. Generator is offset, power being brought in by flexible cable.—Eng News-Record, D 25, 95

New Aviation Gas—A new aviation gas designated as 115/145 grade has been tested and adopted by the U. S. Army Air Forces. It gives up to 15% greater power, speed, and range. It is said to give approximately the same increase over 100 octane gas as premium grade fuel does over regular gas. It was developed by the American Petroleum Industries.—Aviation Wk, D 22, 17



UNUSUAL GENERATOR—Developed for motor bicycles and other small motorized vehicles, the small electric generators of Bendix Products Div. have automatic voltage regulation. Rotating member is an Alnico permanent magnet driven by friction disk bearing on tire or flywheel. Four segments are attached to shaft by spring steel leaves of different strength. As speed increases, centrifugal force causes successive segments to extend to "short circuit" adjacent magnetic poles, giving automatic voltage regulation. A 3½-in. outside dia. generator develops 35 watts at 6-8 volts. Bearings are self-lubricated Oilite. No commutators or contacts are used.—Prod Eng, D, 98

Variable-speed Motor—Centrifugal vibrating contacts controlled by a lever give speed variation between 1,500 and 6,000 rpm. with the new 1/5-hp. constant-torque motor of Guernet Electrical Machinery, Inc.; the lever also starts and stops the motor. The single-phase, universal-wound, 115-volt motor has ball bearings.—Am Mach, D 4, 162

Catalytic Flux—Thermo-Lo Blue is a new flux said to permit welding ferrous metals at lower temperature because of catalytic action. In many cases it is claimed to save preheating. Farrelloy Co. developed it.—Weld Eng, D, 91

Aluminum Lamp Post—Union Metal Mfg. Co. has introduced the first all-aluminum lamp post to be offered commercially.—Elec World, N 22, 140

Strain Gage Measures Gas—For studying flow conditions in gas mains, Consolidated Edison Co. has devised a new type of meter. Four strain gages are mounted in a Wheatstone-bridge circuit on a 3-in. piece of spring steel. One end of steel strip is anchored to gas main, the other supports a steel tripod extending into gas stream and having an aluminum cylinder at the ends. Deflection of cylinder, proportional to gas flow, is measured by the strain gage.—Elec World, D 6, 118

Warms Up Engines—Quick starting of heavy-duty motorized equipment in severest cold is assured by a new externally fired heater. It warms engine coolant as it circulates through a heat exchanger with thermo-syphon head, and exhaust gases warm engine oil, battery, or cab. Developed by Perfection Stove Co., the heater is small enough for mounting in automotive equipment.—Cons Meth, N, 140

Fast Metals Comparator—Quick nondestructive comparison of magnetic or nonmagnetic metal parts can be made with a new instrument of General Electric Co. Specimen is placed within test coil, and a bridge circuit is balanced by zero meter reading. Then other parts can be compared with original at more than 1,500 per hr.—Electronics, D, 148

Improves Wire Rope—A new all-steel wire rope of 17 strands laid together in a single closing operation and all running in the same direction is said to cut rope costs 50%. Strands fit snugly into valleys between eight inside strands. Faster operating speeds and saving on drum and sheave wear are advantages claimed by Jones & Laughlin Steel Corp.—Coal Age, D, 166

Alcohol From Rosin—Natural rosin is the basis for the new resin alcohol developed by Hercules Powder Co. It can be used in fields of textiles, rubber, adhesives, detergents, paints, varnishes, and lacquers. It is a viscous liquid at room temperatures, is colorless, sticky, and does not mix with water.—Business Wk, D 6, 85

FREE SERVICE TO READERS

As a special service to our subscribers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

Reduces Bus Accident Rate

Oklahoma Railway Co. finds safety pays; accident rate reduced 40.6%. Program is based on engineering, education, enforcement, and ejecti

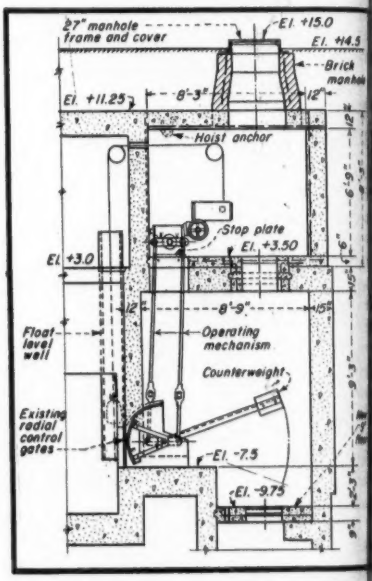
Reduction of 40.6% in the accident rate has been effected in 2 years by a safety program that has been put into effect by Oklahoma Railway Co. The program is based on engineering, education, enforcement, and ejection.

Engineering—Most important factors of traffic engineering are fact finding and records, critical evaluation of high-accident operations, contests and awards, public safety, mechanical failures in relation to accident frequency rates, and safety ideas. The first mentioned is probably the most significant. The accident reporting system is all-important. An accident spot map is an excellent aid in locating hazardous points along routes. When pins begin to group, accident reports should be checked to determine similarity of causes.

To prevent accidents caused by the public, the company using warning signs and stripes risers of entrance steps. But curing the operators is more important. This is done in three steps: discovering operators responsible, analyzing their trouble and attempting correction, and dismissing hopeless cases. The company found that 40.5% of the accidents were caused by 0.5% of the drivers.

Contents and awards play a major roll in safety. Oklahoma bases its program on a monthly point system. For each month a driver has no "chargeable" accidents he receives a bonus of 200 points; an extra 300 points is given for each six months of continuous nonchargeable accident operation. Should he have a chargeable accident he forfeits 500 points. From his accumulated points the driver "buys" premiums put up as prizes by the company. The system costs the company about $11 per employee per year.

Education—Preemployment schools are conducted for new operators. But education does not end here. Experience drivers also attend refresher schools co ering safety, public relations, courtes schedules, and conservation of equipme Safety posters or stickers are used



SEWAGE CONTROL GATE—Radial div sion gates providing quick responsive fl and eliminating delayed maintenance ha been installed in the Stickley, Ill., sanita system, serving about 450 sq. mi. and 7,00 000 persons. Handling storm flow and sew has been greatly facilitated. Gates are co trolled from a central panel, the position the gates being indicated on meters. Wa levels are continuously indicated. Mot operated gate mechanism includes a tor switch that will operate if gate closes aga an obstruction. This stops motor and sou alarm at control point; further closing the gate is impossible.—Eng News-Rec 11, 117

remind the operator and public of the need for safety. They are changed frequently.

Enforcement—If enforcement of regulations becomes lax, operators feel they can "get by." The company operates two prowl cars used primarily to report regulation violations.

Ejection—If the first three points of the program fail, the operator must be fired. This is a difficult job where union drivers are employed. It is absolutely essential that accurate and complete records be maintained to substantiate dismissals.—Bus Trans, D, 61

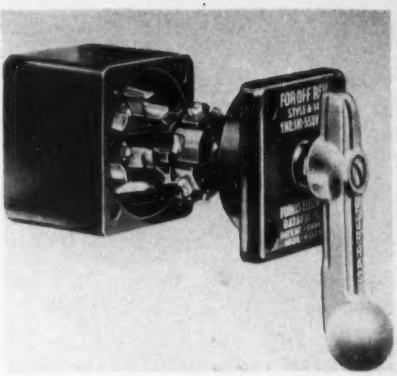
TELEPHONE MESSAGES PASSED ON BY RADIO

Radio communication is being used by Brooklyn Telephone Answering Service to supplement its regular function. Subscribers are principally doctors. Included, however, are an oxygen service, private ambulance operators, collision and towing-truck companies, commercial refrigeration emergency crews, marine riggers, limousine services, and fire adjusters. Most of these are served by the supplementary radio dispatching service. The subscriber in his car, or anyone calling him, talks only to the Answering Service operator-secretary, except that a doctor can call briefly through the service to inform his office of his whereabouts.

For customers supplying their own car radio equipment, the cost is $17.50 a month for the first 100 messages, 15¢ each for the next 100.—Electronics, Ja, 97

PROPELLER BRAKING

Application of reversible-pitch propellers to production aircraft may permit weight saving of up to 800 lb. by reducing requirements for brake specifications. This would be a 50% saving in some planes. In tests, reversible-pitch propellers smoothed stops, reduced tire wear, and gave more positive action on slippery runways.—Aviation Wk, D 15, 33



PLASTIC CUTS COST—By using a molded phenolic plastic body instead of a drawn steel cover, production cost of Furnas Electric Co. motor control switches has been reduced and appearance improved. Body is one-piece molded plastic construction with molded terminal barriers and markings. Phosphor bronze stationary finger contacts are mounted by screws through holes in the body, the screws being used for terminal connections. Plastic rotor has molded-in copper contacts. Cover, body, and rotor are produced simultaneously in a multiple-cavity die.—Prod Eng, D, 98

FRESH MEAT PACKAGED

When the cheaper fresh meats are prepackaged for sale in the retail stores, housewives buy more of them. These include stew meats, ground beef, patties, kidneys, hearts, and many others. There is added revenue in prepackaging giveaway items such as suet and soup bones. One chain store sells two packaged lambleg bones for 14¢ instead of selling them back to the packer for a few cents. Some stores have increased their sales volume with a lower overhead as a result of greater turnover of less popular, slowly moving items, such as stew meats, soup meat, and sweetbread.

Outstanding advantage of self-servicing prepackaged meats is the time saved by customers and butchers.—Food Ind, D, 102

PLANT LAYOUT SHOWN ON DISAPPEARING BOARDS

The entire plant of Bullard Co. is reproduced on eight 4 x 8-ft. sections of wallboard suspended in a frame similarly to windows in a spring sash. Scale is ¼ in. = 1 ft. Drawings or blueprints show in outline the principal fixtures of the building; cardboard templets represent production machinery. When the plant layout is to be altered, proposed changes are made on the blueprints in chalk and templets are shifted until the best possible layout is determined. Then millwrights, riggers, and electricians are called in for final pre-movement arrangements.—Factory, D, 81

NOVEL PRODUCT DESIGNS

Heat Motor Winds Clock—In the "Atmos" clock of Jaeger-Le Coultre, Geneva, the driving spring is wound by energy derived from atmospheric temperature changes. The winder is a spring-opposed metal bellows. Ethyl chloride is sealed between bellows and a drum. As temperature decreases, decreased vapor pressure permits spring to expand bellows and pull chain which winds driving spring.

Unique Valve Position—A V-8 German reconnaissance car engine has over head valves set vertically in engine bo at 45 deg. to cylinder axis. Purpose ap parently is to reduce overall height an width and shorten pushrods to reduc inertia and deflection. Composite piston have aluminum heads bolted to semi-stee skirts.—Prod Eng, D, 100

Welded Milk Cooler—A direct-expan sion stainless steel milk cooler, fabricate by welding, has been developed in Ger many. Unit consists of a 9-in. dia. heade drum with 34 vertical tubes.—Weld Eng D, 80

WILL MAKE COSMIC RAYS

Simpler and less expensive than a syn chrotron, the electron linear accelerato consists of a waveguide lined with gold plated disks. It retards 4-cm. micro waves to velocity of injected electrons then the electrons traveling with th wave are accelerated by its potentia gradient. A 3-ft. long unit gives elec trons an energy of 1,500,000 electro volts. A final 100- to 200-ft. model a Stanford will develop a billion electro volts and will produce cosmic rays.

The accelerator is excited for a mi lionth of a second every 60th of a secon from a magnetron.—Electronics, N, 144

STEEL HOUSES—Fi all-steel, prefabricate houses, lattice we metal roof joists a being used. Peake roof eliminates th flat-roof lines ofte seen in prefabricate homes. This all-ste three-bedroom hous designed by Willia H. Harman Corp., c be constructed in 1 days with local labo Cost is $7,769. By u ing auto assembly li techniques, the factor can turn out a dwe ing in 12 min. Ligh weight steel sheets a made strong by te sion bars.—Science N Ja, 72

AUTO SEE-SAW — With this see-saw upper deck, Crosley Motor Car Corp. will be able to ship two more cars per freight car. Car is driven up ramp, pivots on horizontal bar, and is then locked in place by tie rods from the roof. Each installation costs $250. —Business Wk, D 6, 46

SILICONE PAINTS MOST HEAT-RESISTANT

Recent developments with silicone resins and esters have led to some of the best heat-resistant paints yet discovered. Entirely free of yellowing or chalking, and having exceptional permanence of flexibility and gloss, silicone paints can be furnished in almost any color and applied by any of the conventional methods. Silicone paints, with the addition of aluminum pigments, can withstand temperatures considerably above 500°F.

Silicone resins, with the addition of glass fiber, asbestos, or mica, have produced electric motor insulating varnishes which will hold up at 390 to 590°F. for thousands of hours.

Silicone paints are relatively expensive, and the finish must be heat cured. However, manufacturers of gas and electric ranges, among others, are making increasing use of these paints.

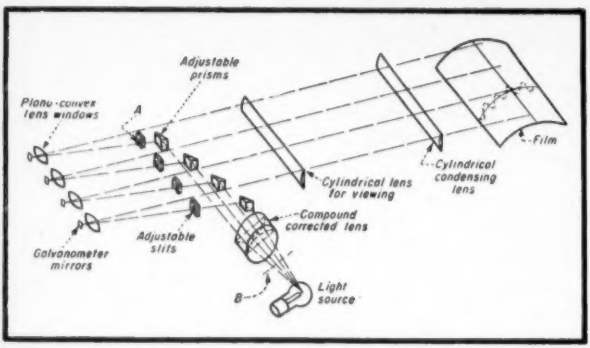
Standard for heat-resistant paints is made up of silicone resin DC801, thinned with xylol and pigmented with 10 oz. of aluminum powder per gallon of vehicle. After 40 hr. at 1000°F., this finish showed complete film integrity. Some 50 other paints were tested for comparison. Three passed the 800°F. test. Two of these contained silicone resin DC801, pigmented with aluminum or a combination of zinc dust, zinc oxide, and graphite. The third, which withstood 950°F. for 40 hr., contained refined linseed and fish oils, together with zinc dust, zinc oxide, and graphite.—Prod Eng, D, 85

ALLOY SIDE-DUMP CAGE

Without alteration of its hoisting shaft, Christopher Mining Co. is raising 6 tons of coal in steel cars instead of 3 tons in wooden cars as before. Shift to duralumin cage saved 40% in weight over steel cage previously used. The side-dumping cage is 8 ft. wide, 16 ft. 1 in. long, and weighs 11 tons. The old 400-hp. motor is used, but a new single cylindro-conical, double-grooved drum has been installed. Drum accommodates two 1¼-in. ropes for cage suspension and two similar ropes for counterweight.—Coal Age, D, 94

WORLD CONFERENCE IN '49

Under the auspices of the World Engineering Conference, an international Technical Conference will be held in March, 1949, in Cairo, Egypt. The meeting will be devoted to matters of a general technical nature, social and professional problems of the engineer, and technical progress in Egypt and the Middle East. All technical men of the world will be invited.—Prod. Eng, D, 150



COLOR OSCILLOGRAMS—Oscillograms with seven traces, each in different color to reduce confusion, can be produced by new Westinghouse technique. Optical system and filters required are shown. Seven-element mechanical oscillograph is used, with 50-cp. lamp as light source for optical system. Recording is on color film.—Elec World, D 20, 76

FILMS—NEW LANGUAGE FOR INDUSTRY, BUSINESS

Because they give everyone in the audience the advantage of individual explanation, industry and business are turning more and more to the use of films and film strips. On the screen, details can be given with complete clarity, often impossible merely with words and standard aids.

In explanation of abstractions and details, animated drawings aid in simplification and understanding.

The development of stereoscopic slide films permits three-dimensional viewing of black-and-white or color films. Two images are projected onto the screen, polarized in different directions. Special polarized glasses let the audience see the objects in three-dimensions. Silent slidefilms, since they can be left on the screen, permit the instructor to go into greater detail if necessary.

These media are used by industry for a wide variety of purposes—training, selling, employee relations, and economic explanation. A recent survey by the Association of National Advertisers shows that over 70% of the members have used this medium.

Aluminum Co. of America uses motion pictures and slidefilms as standard tools in its training program. It also uses theatrical motion pictures for entertainment during rest periods. The magazine *Syndicate Store Merchandiser* produces films and slidefilms for training of sales personnel in 5–10¢ stores. It makes wide use of animated cartoon characters for this purpose. The New York Central Railroad plans, writes, and films its own movies, and uses the motion picture department at times to assist the engineering department in studies of operating conditions. Most companies use the facilities of commercial film companies to produce their pictures.

Since movement of heavy machinery for sales demonstrations is costly and difficult, Caterpillar Tractor Co. uses films to show power and performance of its products.—*From "Films in Business and Industry," McGraw-Hill Book Co.*

AIRLINE TICKET ROBOT

Most of the hand work in airline passenger reservation sections is done automatically by International Telephone & Telegraph Corp.'s new automatic booking exchange. Agent gets customer's information as to date, flight number, departure point, destination, and seat number. This is transmitted to the machine by a keyboard in front of agent. The machine immediately flashes the agent if the space is available or indicates the nearest thing available to the desired space.—Business Wk, D 6, 85

Tariffs Cut on Machinery

Geneva agreements will benefit purchasers and manufacturers of industrial equipment. Important concessions listed for several countries

World trade in industrial machinery will be facilitated by numerous tariff concessions made on these products at the Geneva Tariff and Trade Conference. The new tariffs became effective on Jan. 1 in Australia, the Belgium-Netherlands-Luxemburg Customs Union, Canada, France, United Kingdom, and United States. Others of the 23 participating countries will put their agreements into effect as soon as their constitutions or the laws permit, which must be accomplished by June 30, 1948, at the latest.

Purchasers of U. S. equipment in the various countries will benefit from the following concessions. (The most-favored-nation clause of the agreement will extend these concessions to other nations making such equipment—THE EDITORS.)

United Kingdom—Bound the tariff rates on machine tools at 20% ad valorem and reduced portable pneumatic tools from 20 to 15%. Other items reduced from 20 to 15% include: excavating, lifting, and rolling mill machinery and air and gas compressors and exhausters. The duty on stationary internal combustion engines was reduced slightly and most textile machinery was either bound at 20% or reduced to 15%. Duties on certain printing presses were reduced to 15%, on can casing machines by 25%.

Canada—Reduced the duty on boilers from 25 to 20%. Ore crushers and certain other mining machinery was reduced from 17½ to 15%. Locomotives and railway motor cars for mining, metallurgical, and forest industries, when of a class not made in Canada, were bound free. Machinery "not otherwise provided for" was bound at 10% for items of kind not made in Canada, 25% if made in Canada.

France—Concessions granted on machine tools and machinery for the most part returned the duty rates to 1936–38 levels, which were about half of the minimum tariff rate just before this new agreement. Under the new agreement the following rates apply: semi- and automatic lathes were cut from 25 to 12½% ad valorem. Machines for grinding, polishing, lapping, dressing and surface planing, working by means of grindstones and abrasions and polishing products, with micrometric setting system, from 25 to 13¾%. Embossing, drifting, or broaching machines, from 25 to 12½%. Boring, milling, threading, planing, sliding lathes, vertical lathes, other machine tools working by removal of metal, from 25 to a range of 6, 14, 18%. Gear cutting machines from 25 to 10%. Small portable electric tools, with or without motors, from 25 to 10%. Metal grinders without micrometric setters, from 25 to 10%. Tractors, caterpillar and wheel, from 70 to 15–35% ad valorem per weight factor.

Australia—Eliminated the duty and preference on monoline composing ma-

STOPS SKIDDING—Sand, carried in the car trunk, flows through piping to outlets just ahead of both rear wheels, providing better traction on slippery roads. Sand is released by operating a control as brakes are applied. —Business Wk, D 20, 32

chines, reduced the duty on linotype, monotype, and type composing machines from 30 to 15%. Drilling, milling, planing and shaping machines, lathes, portable pneumatic hand tools were cut from 19 to 15%.

India—Bound 10% duties on numerous types of machinery for mining, oil crushing and refining, refrigerating, well drilling, shoe manufacturing, sugar manufacturing and refining, and metal working (except machine tools) machines.

Burma—Bound a 10% duty on most mining machinery, oil crushing and refining machinery, and machine pumps, and reduced duties on refrigerating machinery and hand pumps.

Southern Rhodesia—Bound the present duties of 5% on certain types of mining machinery, pumps and accessories, and machine tools.

New Zealand — Conceded reductions from 30.625 to 15% on machinery for boring and well drilling. Reductions were made on duties for machine tools from 30.625 to 20%. Sewing machines were bound at 3%.

Union of South Africa—Lowered the preference and reduced the duty on industrial machinery. The margin of preference on cranes, excavators, winches, etc., was eliminated, and the duty bound. Machinery for factory installation, agricutural machinery, stone crushers, road rollers, road construction and street sweeping and spraying were bound on the free list. Air conditioning and mining machinery was bound at 5% duty.

Benelux (Belgium-Netherlands-Luxemburg)—Bound machine tools at 6% and agreed to maintain a moderate rate on numerous kinds of machinery and appliances, including certain pumps, prime movers, hydraulic, and other presses, and lifting, and road-building machinery.

Czechoslovakia—Lathes, planing, shaping, and milling machines, over 1,000 kilograms, bound at 1,000 crowns per 100 kilograms.

Norway—Assured the maintenance of duty free treatment on typesetting machines, linotypes, printing presses, a certain pneumatic tools.

Cuba—Substantially lowered duties o railway passenger coaches and acce sories for pumps and boilers. A bindi of existing rates was obtained on sug machinery and sewing machines.

Brazil—Agreed to hold the duty bel 10% on power pumps, steam boilers, compressors, power excavators a dredges, pneumatic tools, certain pow cranes and hoists, internal combusti engines, road building machinery, lin types and other typographical machine air-conditioning machinery, grindi mills, heavy industrial presses, saw machines, large power vises and lath industrial fans, dust extractors, and oth specified industrial machines. Duties gasoline pumps and certain other m chinery were held to less than 20%.

Chile—Reduced the duty by 30% machine saws. Duty on warehouse truc was reduced from 0.15 gold pesos p gross kilo to 0.05 pesos per net kilo. Cu for portable railroads and ferry cabl were reduced 50%. Bindings of moder duty rates were obtained on mining m chinery, pumps, cranes, winches, tachi pulleys, blocks, certain industrial m chinery, spare parts for road machine polishing disks, drills, internal combu tion engines, wheels, axles, and ri weighing over 50 net kilograms, and pa for railroad machinery.

China—Bound at 7½% rate on machi tools, and a 10% rate on pumps, indu trial refrigeration machinery, and a lo list of miscellaneous heavy machines. 25 percent reduction was obtained on g oil, and steam engines, and on steam a hydraulic turbines. Duty on sewing m chines was bound.—Am Mach, D 4, 12

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MAJOR TARIFF CONCESSIONS MADE BY U. S. AT GENEVA

Tariff concessions will increase U. S. imports, improving trade balance and making more dollars available. Concessions on leading items are listed

Commodities in order of magnitude of duty collected in 1939	Value of dutiable imports 1939 (in $1,000)	Average rate of duty 1939	Concessions made by United States at Geneva
Sugar	80,097	55.8%	Average reductions of 25%
Beverages (incl. Alcohol)	59,248	57.2%	Whiskey duty off 40%. Brandy 50%. Wines reduced variously
Wool and Manufactures	49,554	68.5%	Duties on raw wool, worsteds and woolens off 25%; ad valorem duty on worsteds and woolens down from 35-45% to 25%
Tobacco and Manufactures	36,000	66.5%	50% reduction on filler and scrap; slight reductions on cigars
Cotton Manufactures and Semi-manufactures	32,595	42.4%	Slight reduction all around
Petroleum and Products	27,163	28.7%	Duties on unfinished petroleum oils of 50%; same on gasoline and naphtha
Wood and Manufactures	23,647	9.8%	Duties on several species of soft-wood lumber off 50%. Furniture off 50%; mahogany lumber off slightly less
Chemicals (industrial and medicinal)	23,083	34.0%	Reductions in certain industrials ranged from 20 to 50%
Leather and Manufactures	16,092	24.0%	Fancy leather off 50%; certain other non-shoe leathers off 10%. Shoes and gloves generally off 10%
Iron and Steel Manufactures and semi-manufactures	15,055	22.8%	Most metalworking machinery was off 50%; textile machinery is down to 10 to 40% ad valorem from 20 to 40%; many iron and steel semi-manufactures off 25%
Vegetable oils, expressed, edible, inedible	13,387	62.9%	Reductions range from 30 to 50% on inedibles; others generally bound
Dairy Products	13,232	31.5%	Duties off between 20 and 50% on most items
Ferro-alloys	13,006	38.5%	Ad valorem reductions based on percentage content. Other ores including bauxite, tungsten, manganese and crude aluminum, off from 20-50%
Rayon and Manufactures	11,304	34.1%	Duties on medium and coarse rayon yarn off 50%; slight reductions on staple fibers and woven fabrics; Rayon nets and nettings off 20%
Paper and Manufactures	10,904	29.8%	Various types of pulp-and paper board, cigarette paper and other tissues off 25 to 50%
Silk Manufactures	7,042	56.9%	Broadsilks, if valued over $5.50 per lb. had a 20% lower duty
Furs and Manufactures	5,342	33.7%	Duties generally reduced 50%; black and silver foxes excepted
Glass and Glass Products	5,152	61.7%	Plate glass duties off 50%; sheet 30%; fancy glass 20% generally

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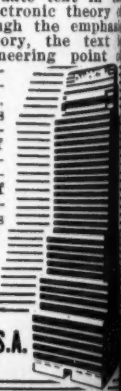

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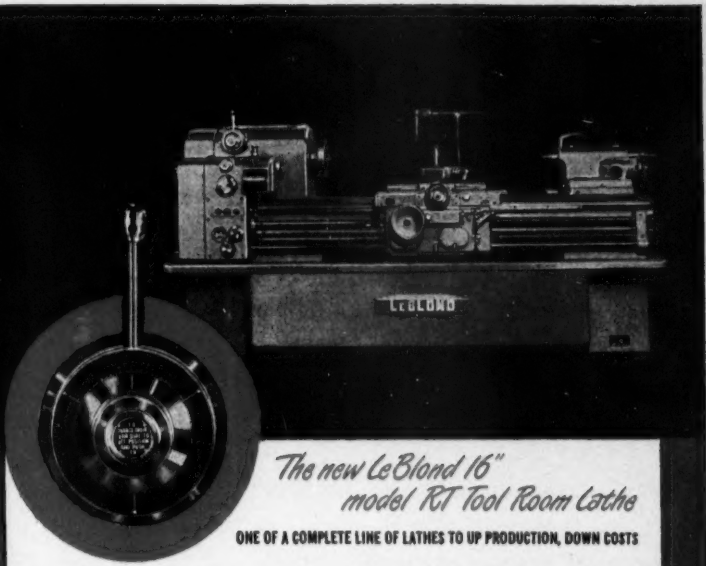

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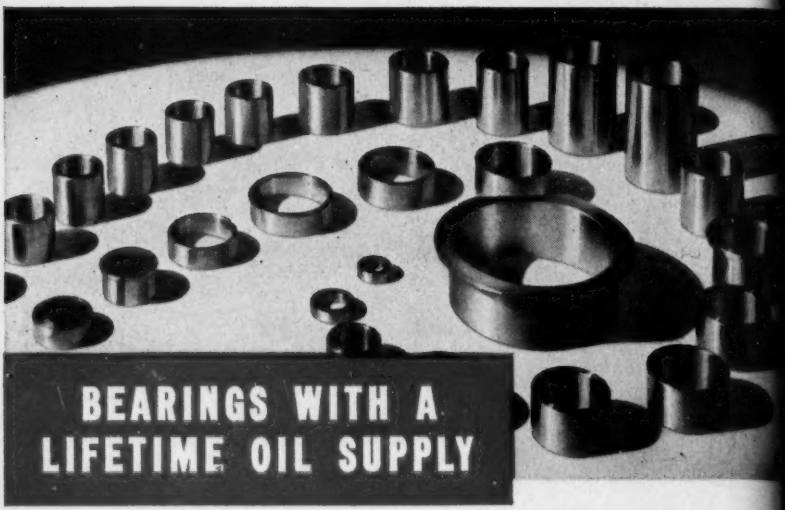

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